Faculty of Engineering Technology
The Open University of Sri Lanka

Proceedings of Faculty of Engineering Technology
Student Academic Conference 2014, OUSL

Abstracts

ISSN 2420-7632

Proceedings of Faculty of Engineering Technology Student Academic Conference 2014

15 December 2014

Cover Page Design: Miss Sherin Samadhi Ginige

Faculty of Engineering Technology Student Academic Conference 2014 and the Publication of Proceedings are sponsored by Higher Education for Twenty First Centaury (HETC), Project, Ministry of Higher Education, Sri Lanka.

Message from the Vice Chancellor

It is with great pleasure that I extend this message on the inaugural Student Academic Conference organized by the students of the Faculty of Engineering Technology at The Open University of Sri Lanka. This event is a first for the University where the students themselves have initiated a very commendable academic activity. I have no doubt that this event will enhance the academic status of the Faculty as well as of the University within the academic community of Sri Lanka.

This conference is unique in nature as it will provide an opportunity to the students to present their final year research project outcomes to a wider forum. As a result, more avenues for interaction with industry can be established paving the way for possible commercialization for the betterment of the society. It is also an opportunity for the students to gain valuable experience in organizing such an important event. This will certainly enrich their personality development making them better prospects in the job market.

It is my sincere hope that the students of this University will continue to organize this event, with increased involvement, in the future; thus helping to enhance the social and industry recognition of our graduates. I will also take this opportunity to express my appreciation to the staff of the Faculty of Engineering Technology for encouraging their students to organize this very important event. Furthermore, I thank the HETC Project of the Ministry of Higher Education for sponsoring this event.

Finally, I wish all presenters and participants of the Student Academic Conference 2014 all good success.

Dr. Vijitha Nanayakkara
Vice-Chancellor
December 05, 2014.

Message from the Dean/ Engineering Technology

On behalf of the Faculty of Engineering Technology, I take much pleasure in writing this felicitation on the occasion of the Faculty of Engineering Technology Student Academic Conference (FETSAC) - 2014. This is the first ever student conference organized by the Faculty and our sincere hope is that this would become an annual event of the Faculty in the years to come. In parallel to the Student Academic Conference we have also organized a Student Exhibition, where our students will be displaying their 'products' which are the result of their final year undergraduate research project.

This proceedings of the FETSAC – 2014 consist of abstracts of the final year undergraduate research project undertaken by our students belonging to the three degree programmes offered by the Faculty of Engineering Technology (FET): Bachelor of Technology (Engineering), Bachelor of Industrial Studies and Bachelor of Software Engineering.

FETSAC – 2104 has been organized under one of the activities planned for improving the Industry relevance of the FET graduates. This programme is part of the assignment undertaken by the FET under the Quality and Innovation Grant (QIG) of the Higher Education for Twenty First Century (HETC) project administered by the University Grants Commission (UGC).

Through this initiative the FET envisages to showcase the undergraduate research projects of our students to Industry and inform the Industry about the innovative and cutting edge research carried out by our students under the guidance of the academic staff. We believe through this, we would be able to build a bridge between the University and the Industry with the long-term plan of bringing in the Industry related problems to the University and thus providing solutions to these problems through Industry-University partnerships. As another facilitative enterprise of this endeavour, the FET will shortly launch an Industry-University Liaison Centre within the University. We hope this centre will expand in the future to encompass all the Faculties of the University.

I am very delighted to note that this initiative has been enthusiastically taken on board by our students who have responded in large numbers by contributing abstracts to the conference and also being actively involved in organizing the conference and the related events.

I take this opportunity to thank the QIG project team of the Faculty, very especially the group of academics who are responsible for the Conference and the related events, for all the hard work done in rallying the students to contribute and participate in the organizing and conduct of the events. I would also like to extend my sincere thanks to our Vice Chancellor for all the support and encouragement provided. My thanks are also due to the HETC project team for the provision of funds to conduct these events.

I wish all success for FETSAC – 2014 and the related events.

Prof S. A. Ariadurai
Dean – Faculty of Engineering Technology
The Open University of Sri Lanka
December 01, 2014

Message from Chairperson - Organizing Committee (Staff)

I, with great pleasure, issue this message in the occasion that the students of the Faculty of Engineering Technology of the Open University of Sri Lanka hold the first Student Academic Conference in 2014. The benefits of such a conference undoubtedly are many fold. Firstly, it provides the students with a stage to present the finding of their undergraduate research projects to a forum of wider participation. We have observed that quite a number of research projects addressing the problems covering a wide spectrum in the society have resulted in feasible outcomes and these could be successfully implemented at commercial scale with proper follow up action. A conference of this nature will certainly allows the interested parties to pick such innovative concepts and designs for commercialization, of course with further developments in collaboration with the Faculty. Secondly, the students will get an opportunity to present their project outcomes to a recognized forum thereby giving value and recognition to their research projects. Lastly, the most importantly, it is an invaluable opportunity to the students to take part in different activities connected with organizing such an event, hence instill themselves, skills such as team work, communication, leadership, face challenges, etc that are much needed to shape up the their personality and career development in the future.

While appreciating the students in organizing the Student Academic Conference for the first time, I take this opportunity, on behalf of the Staff Organizing Committee, to express our gratitude to Dr Vijitha Nanayakkara, Vice Chancellor, for his readily extended support to the staff and the students in organizing this event. Also, the committee very humbly appreciates the support extended by Prof S.A. Ariaduari, Dean/Engineering Technology to make this event a success. The assistance provided by the academic staff members to prepare the abstracts and reviewing the same in very short time period were very much encouraging and the committee records its appreciation for their contribution.

I specially express my gratefulness to Dr A. P. Madurapperuma, Head/Department of Electrical and Computer Engineering, who provided initiative to organize this type of student conference along with a “Faculty Open Day “ in order to strengthen the relationships with the industry and thereby make our graduates more industry relevant.

Finally, I urge all students to make an avenue for future students to gain the same benefits derived from this event by continuing it into subsequent years. Further, continuation of this very important event will certainly be a motivation to the students to embark on projects with more value to the industry and to the society at large.

Dr N. S. Senanayake
Chairperson
Organizing Committee (Staff) – FETSAC 2014
December 01, 2014

Message from Chairperson - Organizing Committee (Students)

I am pleased to send this message on behalf of the student organizing committee of FETSAC 2014. FETSAC 2014 is the first ever student academic conference to be held at the Faculty of engineering Technology, of the Open University of Sri Lanka, since its establishment. We are very much glad to be part of this event. The main objective of FETSAC 2014 is to make a platform to present outcomes of research projects carried out by our fellow colleagues, thereby giving their efforts a due recognition and open an avenue for further investigations in collaboration with interested parties, especially the industry. Also we hope this kind of student academic conferences will allow students to share knowledge among them and to improve technical knowledge of students while providing an exposure for organizing such events.

The conference theme for FETSAC2014 is “Innovate the Future”. Our main intention in choosing this theme is to highlight that the future has to be explicitly recognized and discovered in the face of fast developing technology in every aspects that will have a big impact on the society. So as future engineers we should align our thinking to foresee the future in the light of fast developing technology in every sphere of the society. In other words, we should discover the future rather than waiting for the future comes to us. In view of reflecting this concept the theme “Innovate the Future will give motivation to all of us to thick critically to face the future problems and address them effectively for the benefit of society.

Finally, I like to thank student organizing committee members of FETSAC 2014 for their enthusiasm, commitment, dedication and hard work to make this event successful. I am also indebted to our Vice Chancellor, Dean of the Faculty of Engineering Technology and all the staff of the faculty and the University who extended invaluable support to make this event a success.

M. Niroshan

Chairperson

Organizing Committee (Students) - FETSAC2014

December 01, 2014

Organizing Committee

Organizing committee (staff)

Dr N. S. Senanayake (Chairperson)

Prof S. A. Ariadurai

Prof C. S. De Silva

Dr B. C. L. Athapattu

Dr D. A. R. Dolage

Dr D. H. R. J. Wimalasiri

Mr D. N. Balasuriya

Mrs T. P. G. N. T. Alwis

Mrs. H. A. A. E. Perera

Mr Kasun Devpriya

Miss L. A. M. P. Nimalaratne

Mr D. H. N. C. Dassanayake

Miss T. N. Fernando

Organizing Committee (Students)

Mr. M. Niroshan

Mr. P. D. S. H. Gunawardane

Mr. U. S. S. Perera

Miss. G. S. S. De Silva

Mr. C. R. M. Anthony

Mr. N. C. Tantrigoda

Mr. V. G. M. Aravinda Tissa

Miss. W. A. N. J. M. Ranathunga

Mr. R. J. H. B. Rajapaksha

Miss. W. A. K. H. P. Sewwandi

Miss. B. Srividya

The Open University of Sri Lanka

Vision

"To be the premier Open and Distance Learning institution in Asia through excellence, efficiency and equity in life-long learning."

Mission

"To enhance access to high quality, affordable and relevant education through Open Distance Education and ensure life-long learning opportunities to face challenges in a knowledge society."

"The mission of the Faculty of Engineering Technology is to provide life-long learning opportunities in Engineering and Technology for all to meet industrial and social needs through Open Distance learning and support research & scholarship by efficient & sustainable use of resources."

Content

Abstract No: AE101

Identification of Effective Seed Treatments and Fertilizer for Seedling Growth for Early Grafting of Ber (*Ziziphus Mauritiana* Lam.)

J. M. A. B.V. B. Jayasekara

Department of Agricultural and Plantation Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
bchini.jay@gmail.com

Ber (*Ziziphus mauritiana* Lam.) popularly known as poor man's fruit is an economically important tropical fruit tree, which is grown all over the drier parts of the Indian subcontinent, Africa and northern Australia for its fresh fruits. It is particularly a good tree to grow in dry regions, because it can withstand long periods of drought and can be successfully cultivated even in the most marginal lands with few agricultural inputs and little attention. Ber is now becoming popular in Sri Lanka as an underutilized fruit crop. Ber Fruits can be harvested 3-4 times in a season, providing a steady crop for a longer period. Ber can provide sustained production irrespective of occurrence of drought and can yield between 50 kg and 200 kg of fruits depending on the climatic conditions giving a steady income for local farmers. However, there is a deficit in producing the planting materials for farmers due to longer time taken for germination of hard coated stony seeds and time taken to reach the seedlings for grafting stage. Therefore the present study attempted to determine the seed treatments which could enhance the germination and fertilizer treatments which could enhance the growth of seedlings. The study was conducted during the Yala season of 2014 at Fruit crop Research and Development Stations research fields as two separate experiments. Five seed treatments (T1- Extracted seeds, T2- Extracted seeds were soaked for 6hrs in 500ppm Gibberelic Acid, T3- Seed stones were soaked in 97% sulfuric acid for 30 min , T4- Seed stone were soaked in water for 40hrs, and T5 - Control) were evaluated in Randomized Complete Block Design with three replicates as experiment one (Germination study). Number of days taken for germination, germination percentage and the survivability of the seedling were measured. In the second study five fertilizer treatments (T1- Urea,T2- N20%: P20%:K20% mixture, T3- T65, T4 -Blue granules, and T5- without fertilizer) were evaluated in completely Randomized Design with three replicates. Plant height, plant girth, leaves per seedling, root length, root girth, fresh weight, and dry weight of seedlings were measured as growth parameters. The result of the Germination study showed statistically significant difference between pre-sowing seed treatment on germination and survivability of seedlings. Early and highest seed germination together with best survivability was obtained in Extracted seeds were soaked for 6hrs in 500ppm GA3. However, at the transplanting stage application of Gibberellic acid was not significantly different from the manual cracking of seed coat. The results also shows that the application of sulfuric acid enhances the seed germination but at a slower rate. In contrast lowest rate of seed germination, maximum number of dates taken for the germination and lower survivability rate were observed in control (T5). The data on growth parameters revealed that the seedling growth was enhanced significantly with the application of different fertilizer mixtures. Growth was found more pronounced in all parameters measured in T3 (application of "T65" mixture) while lowest seedling growth was observed when no fertilizer was applied. This study concludes that breaking of seed coat manually is as good as the application of Gibberellic acid in breaking the dormancy of Ber seeds. The study also concludes that the best fertilizer treatment for the growth of seedling of Ber plant is the pre-mixture known as T65 (N 20%: P 20%: K48%, Mg 12%).

Supervisor/s: Dr (Mrs). K.W. Ketiperachchi and Dr S. Thrikawala

Abstract No: AE102

Effect of Potting Mixture and Fertilizer Application on Early Grafting of Mango Seedlings

W. M. K.W. S. S. Kotandeniya

Department of Agricultural and Plantation Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
senanikotandeniya@ymail.com

With mango becoming popular fruit in Sri Lanka the demand for planting materials particularly for newly released varieties which are used in commercial orchards and home gardens is increasing. Grafting is a common and preferred vegetative propagation method for mango trees. To cater the increasing demand good quality grafted plants should be produced within a shorter period of time, at affordable prices. Currently production of planting materials takes about 18 months and quality of planting materials is varied among different nurseries. However, it has been found that by providing proper management practices i.e. proper fertilization could shorten the time taken for grafting and produce planting materials efficiently. Further, the cost of production can be reduced by using a smaller bag size and substituting the top soil with cheaper and readily available paddy husk. Therefore this investigation aimed to improve production process of grafted mango plants with proper fertilizer application using smaller pot size and substituting topsoil with paddy husk. The experiment was carried out as a 3x3 Factorial experiment where treatments were arranged in a Completely Randomized Block design, with five replicate. Three factors used in the experiment were Potting mixture (Sand: Soil: Compost 1:1:1, Sand: Compost 1:1 and Sand: Compost: Burnt paddy husk 1:1:1) and fertilizer mixture (NPK mixture, Albert solution and control) respectively. The results of the study showed significant differences between potting mixture and fertilizer mixtures on plant girth, plant height, number of leaves, plant vigour and root length. The results revealed that Albert's solution with Sand: Compost: Burnt paddy husk 1:1:1 was the most effective treatment compared with other treatments. The same treatment showed the highest percentage of plants (68%) which achieved the suitable characters for grafting three months of planting. However, the cost analysis found using Albert solution is more expensive than granular fertilizer application.

Supervisor/s Dr. S. Thrikawala and Dr E. R. S. P. Edirimanna

Abstract No: AE103

Reduction of High Initial Microbial Load in Raw Milk Collected from Kurunagala Area in Order to Reduce the Wastage

S. A. S. D. De Silva

Department of Agricultural and Plantation Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
Shermy.dinushi@yahoo.com

The purpose of this study was to assess the initial microbial quality of raw milk in Kurunagala, Sri Lanka in order to reduce the wastage of raw milk. Out of thirteen chilling centers, Badalgama, Elabadagama, Kuliyapitiya, Dambadeniya and Minuwangoda chilling centers were randomly selected and the initial microbial loads were tested using Standard Plate Count (SPC) Test. The results obtained from the study indicated that the current situation is critical and needs real improvement from production point to processing plant. The log values of SPC Colony Forming Units (CFU/mL) of above chilling centers were 7.079, 6.568, 6.755, 6.707, and 6.880 respectively and the required standard value should be under log 6.000 CFU/ mL. The exact reason for this condition was investigated. In this study careful observation of chilling center practices, collecting point practices, farmer practices and milk transportation practices were inspected in the field level. Samples of raw milk were collected in different levels of milk handling through the collection process. At the beginning milk samples of all the collecting points were analyzed by Methylene Blue Reduction Test (MBRT) method and poor and unacceptable quality milk were detected. As per the screening results, further investigations were carried out in the field level by a self-fill questionnaire and testing for SPC and microbial spore count test in milk supply chain. In this study 92.2 per cent dairy cows were in good health condition. Out of 64 dairy farms 40.6 per cent were extensive housing system while 56.2 per cent of farms were semi intensive and only 3.1 per cent were conducted as intensive dairy farms. Out of them 59.4 per cent farms bedding material was soil. Hygiene practices of farmers, collecting point managers and chilling center managers were studied and swab samples were taken from the containers use for milk collection process. The storage conditions of raw milk after harvesting, use of unsuitable containers for milk cooling and wrong milking practices were recognized. By rectifying the main causes for high SPC values, all the wrong practices were corrected by using Good Agricultural Practices. Log values of SPC after correction were 5.913, 5.851, 5.851, 5.863 and 5.939 respectively. No antibiotics and chemical adulterations were detected during the study period. Correlation between MBRT (hours) and SPC (CFU/mL) log values was developed using data collected during the study and it strongly correlates with each other.

Supervisor/s: Dr Nimsha Weeakkody and Mr Prasanna Kanugala

Abstract No: AE104

Molecular Characterization of Phloem Necrosis Pathogen of Tea (*Camellia sinensis* (L.) O (Kutnze)

D. G. N. P. Karunajeewa

Department of Agricultural and Plantation Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
nadeekarunajeewa@gmail.com

Tea *"Camellia sinensis"* is an evergreen plant that the young leaves and leaf buds are used to produce the popular beverage tea. Ceylon tea is considered as the finest quality tea in the world and Sri Lanka is the third largest tea exporter in the world. Like other plants tea plant also get infected with various kind of diseases and majority of the recorded diseases of tea and most significantly, all the economically important once are caused by fungi. But this does not rule out the existence of other microorganisms capable of causing some tea diseases, e.g. Red rust disease caused by an alga (*Cephaleuros parasiticus*), Phloem necrosis disease caused by a suspected virus.

Phloem necrosis in tea had been considered as a viral disease and the disease has been reported only from Sri Lanka. The disease has been observed only on the tea planted in the Up country above 1200m (4000ft) of elevation. This disease brings about a gradual decline in the general condition of the bush and in severe cases the bush becomes stunted and unproductive. The said pathogen attacks only the phloem tissues of the tea plant. Hence many researchers argue that phloem necrosis pathogen is not a true virus. They consider it to be a phytoplasma since it categorically affects phloem tissues. To resolve this debate a molecular characterization for the causal agent of phloem necrosis disease in tea was carried out. The study was carried out mainly to clarify the suspected pathogen (Virus or Phytoplasma) and other objectives were to establish a successful detection method for the pathogen and to identify the possible vector/s of phloem necrosis of tea.

The experiment was included a field survey, lab experiment, glass house experiment and a molecular lab experiment. Infected plant materials were collected from some selected estates of Nuwara Eliya district. Each sample was divided to two categories. One was directed to the extraction of pathogen to prove pathogenicity and other was directed to the DNA extraction. Pathogenicity was successfully proven and total genomic DNA was extracted (CTAB method was used) by using both artificially inoculated disease affected plant materials as well as infected plant materials that were collected from the field survey. After the DNA extraction PCR was carried out by using phytoplasma specific primers (P1 & Tint primers were used). Successful amplification was found and approximately 1600bp band was resulted. The resulted PCR amplicons were directed to the sequencing. According to the study it was confirmed that the suspected phloem necrosis pathogen is not a virus and it is a phytoplasma. Further it was found some cultivars behave as the symptomless carriers and it is a menace for tea cultivation; therefore the PCR practice has found as a successful detection method for identify the pathogen before generate next plant generation.

Supervisor/s: N. H. L. Pradeepa, H. Balasuriya, D. C. M. Kulathunga

Abstract No: AE105

Development of Quick and Simple Method for Determination of Available Phosphorus in Soil

I. S. A. Koralage

Department of Agricultural & Plantation Engineering, Faculty of Engineering Technology, The Open University of Sri Lanka
apsi.isa@gmail.com

Soil phosphorus accumulates in intensive cropping lands in Sri Lanka as the result of the majority of Sri Lankan farmers applies higher than the recommended quantity of fertilizer aiming for higher commercial benefits. It is creating environmental problems in Sri Lankan soil such as runoff the excess phosphorus can cause accelerated water bodies eutrophication, accumulates heavy metal in the soil through the phosphorus fertilizers. Soil phosphorus testing before the cultivation is the most useful tool to get the idea about the phosphorus amount in the soil, thereby phosphorus fertilizer can be replenished rather than applying excess fertilizer into the soil. However, due to the prohibitive cost of the chemicals, equipments and several practical problems faced by laboratories, the soil testing service introduced by the Department of Agriculture has not made a significant impact on the soil testing process. Also, farmers are not tending to do the soil test because of the queue for the result thereby cannot get the result on time. Hence, there is a need to introduce a new simple soil phosphorus testing method so that the testing can be done in the field before cultivation and an appropriate on-the-spot fertilizer recommendation be given. This study attempts develop quick and simple phosphorus testing method to get the idea about the phosphorus level in the soil. The study consisted of two steps; soil phosphorus extraction step and extracted phosphorus measuring step. Four new phosphorus extraction methods were used which are Mogen's method, distilled water extraction method, basify distilled water extraction method and acetic acid extraction method. Soil samples received under the soil testing program in of soil chemistry division at HORDI, Gannoruwa were used for the study. The soil phosphorus amount in each soil sample was extracted using Olsen's method and the extracted phosphorus were measured using the Murphy and Riley method. According to the result 75 soil samples; 25 samples of low phosphorus soil, 25 samples of medium phosphorus soil and 25 samples of high phosphorus soils were selected and used to compare the new soil extraction methods. Phosphorus amounts of the samples extracted by each method were measured by Murphy and Riley colorimetrically method and correlated the each method with the Olsen's method. The significant correlations (r^2) of Mogen's method, distilled water extraction method basify distilled water extraction method and acetic acid extraction method with Olsen's method was 0.734, 0.585, 0.654, 0.854. The acetic acid phosphorus extraction method which has the best correlation with the Olsen's method was further simplified and its significant correlation with the Olsen's method was 0.852. With the objective of making simple method suitable for field level testing where a high level of accuracy is generally not required. A color chart was introduced which has three different blue colors to measure the level of phosphorus extracted by the simplified acetic acid method.

Supervisor/s:Prof C. S. De Silva and Dr Priyantha Weerasinghe

Abstract No: AE106

Effect of Different Staking Methods on Pole Bean (*Phaseolus Vulgaris* L.) Yield and Cost Analysis

H. P. R. B. P. Abeyrathne

Department of Agricultural and Plantation Engineering, Faculty of Engineering Technology, The Open University of Sri Lanka
bhadraniabeyrathne@yahoo.com

A research was conducted in the Horticultural Research and Development Institute(HORDI), Gannoruwa, Sri Lanka in 2013 (November) and 2014 (October) to evaluate the effects of four different staking methods on pole bean (*Phaseolus vulgaris* L.) yield and the cost effect of the four staking methods. Four treatments involving staking methods such as twine threads (T1), gunny threads (T2), coir ropes (T3), stakes(T4) with two pole bean varieties of Gannoruwa bill(V1) and Gannoruwa green(V2) were selected for the study. Four stalking method and check varities, "Gannoruwa bill" and "Gannoruwa green" were allotted to a Randomized Complete Block Design (RCBD) with three replicates during the period of Maha season (December to April) in 2013/2014. Data collected were subjected to analysis of variance while the significance means were separated using least significant difference at 0.05% probability level. The result indicated the no significant differences were observed fist flowering and 50% flowering and length of pods. Significant differences were observed among the staking methods on pole bean verities for Number of internodes, 100 pods weights, lengths of vine, total yield and marketable pod yield as revealed by analysis of variance. Significantly higher values showed for average number of internodes, average length of vine and average100 weight of pods coir rope method than check other methods. Lowest value is identified from Twine threads method and gunny threads methods and stakes methods were not significantly different. However, as result average total yield and average marketable pod yield the highest yield recorded stakes methods and the lowest yield recorded twine threads methods. Therefore, as results among the different staking methods on pole bean yield, Stakes method was selected as a best staking method. The maximum marketable value from the deferent stalking methods were represented by the staking method and minimum value represented by the twine threads method. By estimated result of the cost for different staking methods the best staking method was the twine threads method.

Supervisor/s : Dr. S. Thrikawala and Dr. H. M. Ariyarathna

ABSTRACT NO: AE107

Growth Response of Avocado (*Persea Americana* MILL) Grafted Plants by Adding Different Granular and Foliar Fertilizers and their Combinations

R. W. A. B. M. R. P. U. K. Poddalgoda

Department of Agricultural and Plantation Engineering, Faculty of Engineering Technology
The Open University of Sri Lnaka
poornimapoddalgoda@gmail.com

Avocado (*Persea americana* Mill) is a tropical tree, of the Lauraceae family and genus Persea. Avocado is one of the popular fruit crop grown and consumed in Sri Lanka. Rather than rootstocks grafted avocado plants are used mostly for cultivation in home gardens as well as in commercial cultivation nowadays as it is give true type and produce fruits within a short period of time. The potting mixture use to develop the rootstock is same, for growing the grafted plants as repotting is not doing as the grafted/ not plant is keeping in the same pot for more than 6-8 months until field planting. Grafted avocado trees generally take at least 6 months to reach saleable tree size. Reducing time and labor by stimulating tree growth may help to decrease production cost of nurseries. Hence the fertility of this mixture may not sufficient for such period to provide a better growth for the grafted plant. As such some plants will show nutrient deficient symptoms in later part of the growth and it reduces the quality and appearance of grafted plants. If an additional fertilizer is applied to these plants this problem can be avoided and helps to give a better appearance to all plants and at the same time well grown plants can be issued for plantings in a lesser period of time than at present; therefore evaluations of such fertilizers are helping to give a recommendation to the nurserymen for better planting material production. Study has been carried out from 29th January 2014 at Fruit crop research and development station, located at Gannoruwa,Peradeniya. The experiment is conducting as a field experiment in a net house which gives 50% shade. Two hundred forty cleft grafted avocado plants (which were four weeks after grafting) selected for the study. Eight treatments are carrying out in a Randomized Complete Block Design (RCBD) with three replicates. There are ten plants include per one treatment. The granular and foliar fertilizers and their combinations (T1-T8) being tested. Quantitative and qualitative measurements were recorded at 2 weeks interval from the commencement of the experiment. Data were recorded from five randomly selected pots in plots. The results of this study showed that the application of nitrogen liquid fertilizer as a foliar spray at one week interval (T4) possessed not only the highest plant height and number of leaves but also highest survival percentage, least number of dead plants. According to the assessment of leaf colour which was only the qualitative parameter measured in the study also exhibited positive change in application of nitrogen liquid fertilizer as a foliar spray at one week interval (T4). At the same time (T4) nitrogen liquid fertilizer as a foliar spray at one week interval was able to showed a significant change within a short period of time as like three and half months.

Supervisor/s: Dr. H.K.L.K. Gunasekera and Mr. K.G.S. Senavirathne

ABSTRACT NO: AE108

Enhancement of the Expression of Femaleness in Bitter Gourd (*Momordica charantia L.)* Using ETHREL ®

T. P. H. G. P. L. Thennakoon

Department of Agricultural and Plantation Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
Pushpika.lk@gmaill.com

Bitter gourd (*Momordica charantia* L.) belongs to family cucurbitaceae is one of the most important and popular vegetable crop In Sri Lanka. Thinnaweli White (TW), MC43 and Matale Green are the recommended bitter gourd varieties by the Department of Agriculture. Compared to other varieties, Thinnaweli white has less female flowers under normal conditions and the male: female ratio is around 20:1. This flowering behavior is not advantageous and economical, because it results in lower fruit set and yield, which is a common problem in bitter gourd cultivation. The other two verities male female ratio is less than 15:1. That valve is economica1, because of that it results a large number of pistillate flowers per plant. Therefore, this study was planned to investigate the effect of different Ethrel concentrations on the production of female flowers. And find out suitable concentration of Ethrel for suitable sex ratio. The increase of female flowers of bitter gourd directly influences seed production and variety development programs.

A pot experiment was carried out to determine the optimum concentration of Ethrel®, which maximizes the female flower induction of bitter gourd variety Thinnaweli white at Horticultural Crop Research and Development institute, Gannoruwa during Maha season 2013/2014. Seven Ethrel® concentrations namely 100ppm (T_1), 110ppm (T_2), 120ppm (T_3), 130ppm (T_4) , 140ppp (T_5), 150ppm (T_6), 160ppm (T_7) and distilled water was used as control (T_8) . Commercial available product 48% Ethrel® (EC) was used to prepare different concentrations. A total of forty eight pots were arranged according to completely Randomized Design (CRD) with three replicates was used in this study.

Female male ratio, days to 50% male flowering per treatment, days to 50% female flowering per treatment, days to first male flower initiation per treatment, days to first female flower initiation per treatment, length of vine, number of internodes, internodes length, total yield per treatment, number of fruits per treatment, fruit length, fruit width, and fruit weight and number of seeds per fruit were measured. The mean data was subjected to the statically analysis using SAS package and mean separation (Duncan's Multiple Range test at 5% probability level) procedures.

According to the results in flower ratio, minimum male to female ratio (8:1) was observed for 140 ppm treatment while the highest ratio (19:1) observed for the treatment Control. The single fruit weight, fruit length, fruit circumference, number of seeds per fruit, total yield and germination percentage were also observed with 140 ppm. Results suggest that 140 ppm was effective to the increase the yield parameters and the best among the other treatments. In general, effect of ethrel on vegetative growth was not significantly different.

Therefore, which is concluded sex expression in *Momordica charantia* can be modified by applying ethrel and the effective concentration is 140 ppm.

Supervisor/s: Mr. P.K. J. De Mel, Dr. H. Fonseka and Ms. H.M.P.S. Kumari

ABSTRACT NO: AE109

Possibility of Increasing Survival Period of Transplanted Seedling by Applying Super Water Absorbent Polymer

T. N. Fernando

Department of Agricultural and Plantation Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
nilanthifernando45@yahoo.com,

Supper Absorbent Polymers (SAPs) have been used as water and nutrient retaining materials in agricultural and horticultural field, when they are incorporated in to soil. The stored water and nutrients are released slowly if required by the plants. The aim of this preliminary study is to evaluate the survival period of transplanted tomato seedling by applying radiation-grafted copolymers with starch acrylic acid named GAM-sorb, imported from Vietnam. Pot experiment was established in two different locations at the Open University of Sri Lanka (OUSL). Location No. 1 was inside a semi control growth facilator and the location No 2 was a shady enviorenment with diffused sunlight. Plastic pots were filled with 900 g of growth media, coir dust: cattle manure dust: sand: burned paddy husk in the ratio of 1:1:1:1/2. Four rates of SAPs Low level of polymer (L) 0.675 g, High level of polymer (H) 1.35 g, Intermediate high level (M) 2.025 g, Double high level (DH) 2.7 g, were added to each pot. Control experiment was carried out without SAP. Pots were arranged according to Complete Randomized Design with four replicates. Two weeks later, young plants were transplanted to the rate of six (06) plants/pot. The seedlings were watered daily to the field capacity until plants established in the pots. Once seedlings properly established in growth media, watering was stopped. The seedlings were checked daily and wilted seedling numbers were recorded until all plants died and dry weight of died seedlings were weighted. Minitab 14 was used to analysis the data. According to visual observations, wilting days of sedlings in location No 1 was not clearly identified. 15 days after watering was stopped, seedling in location No.1 was not wilted. 20 days after watering was stopped all sedlings were wilted including in control. Seedling of the control placed at location 2 wilted after 15 days and seedling planted at low and high level SAP added meadias were wilted after 20 days. 25 days intermeadiate and duble hight level SAP added midium subjected to wilt. When watering stopped after 25 days all the seddling died. Analysed data indicated that seedling dry weight of these two location were not significant for different rates of SAP ($P > 0.05$). However according to the mean values of dry weights of died seedling in SAP added meadium had the highest values compaired to control. According to the regression analysis 0.06% increasein seedling dry weight with increasing SAP rate in semi control growth facililator and also showed that the 75.8% incresing dry weight in seeedling with increasing SAP rates in shady enviorenment with diffused sunlight. Shady enviorenment with diffused sunlight was the best place for seedling. Seedling could be kept 15 days in control with out appliing water. Further adding SAP to the used growth meadia seedling could be kept more than 15 days with out adding water . 20 days in low and high level polymer added meadia and 22 days in intermediate and double high level SWAP added meadia.

Supervisor/s: Dr A.G.B. Aruggoda, Mr C. K. Disanayaka, Mr S. Kulathunge

ABSTRACT NO: AE110

Phosphorous Characteristics and Maximum Phosphorous Retention of Soils in the Central High Lands of Sri Lanka

B. D. P. C. Samarakkody

Department of Agricultural and Plantation Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
partalee@gmail.com

Phosphorus is one of the nutrient essential for plant growth. The total amount of phosphorus in an average mineral soil is much lower than nitrogen, potassium, calcium or magnesium. However it is the fact that most of the phosphorus present in soil is immediately unavailable to plants. When soluble source of this element are supplied to soils in the form of fertilizers, there phosphorus is often fixed or rendered insoluble, and could become unavailable to higher plants, even under the most ideal field conditions. In Sri Lankan conditions, farmers use higher amounts of synthetic phosphorous fertilizers than they should, especially in areas such as Nuwaraeliya farmers used over fertilization for the intensive agriculture. It causes ground water pollution. Plants cannot utilize all added fertilizers, so the excessive amounts will be accumulate in plant tissues under high concentrations. This may not negatively affect plant growth but it does waste fertilizer and it may have health implications for consumers. Long term continuous application of P fertilizers and other P sources such as organic wastes and manure cause P accumulation in surface horizon. The majority of Sri Lankan farmers apply higher than recommended quantity of fertilizer (National Science Foundation, 2000) aiming for higher economical benefits. There for in agricultural soils when high quantities of phosphorus are received, available P content exceeds the critical P for fertilizer response in this situation; soil P has become more of an environmental concern than an agronomic one in areas with intensive cropping and livestock production. High phosphorous levels are common in vegetable cultivation fields specially in upcountry. Phosphorous content in farming fields in up country has exceeded the limits due to the excessive additions of chemical fertilizer. High concentration of phosphorus is badly affected to environment, animals, and humans. High concentrations of phosphorus in water caused "Eutrophication", which caused death of fish in water. The phosphorus status of 34soil samples representing 4 soil series in the up country vegetable growing regions of Sri Lanka was evaluated by determining the available **P** extracted by the methods.of Olsen, Bray and Kurtz No. 1, water soluble, Morgan's, Mehlich 3 and Mehlich 1 and the various'**P** forms. Total **P** in-the surface soils ranged from 1108 to 4587.31 mg/kg with organic **P** and active **P** constituting only about 20 and 50% of the total P respectively. In general the sandy clay loam soils of the Badulla and walimada and had lower total and organic P but higher active and available P than the rest. The relative abundance of the various inorganic **P** forms was generally in the decreasing order of inactive **P.** Fe**-P,** Al-**P** and Ca**-P. Fe-P** Al-**P** and Ca-**P** were positively correlated with percentage silt and clay and negatively correlated with percentage sand. Available **P** extracted by the six methods was very high in almost all soils. They are positively correlated with Fe-P, Al-P, water soluble and Ca-P, percentage silt and clay and negatively correlated with percentages of sand, and organic carbon. Surface and sub surface soil **- P** correlations with Olsen's, Bray & Kurtz No. 1**-P** and Mehlich- 3 were significant **(P**<0.05) and with Al**-P, Fe-P** Ca-**P** were close to significant.

Supervisor/s: Prof C. S. De Silva and Dr Priyantha Weerasinghe

ABSTRACT NO: AE111

Study the Quality Characteristics of Leafy Type of Tea Produced with Different Leaf Standards at Higher Inlet Drying Temperature Levels

S. Kavish

Department of Agricultural and Plantation Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
skavisu@gmail.com

Study was carried out to examine the appropriate higher inlet drying temperatures in Endless Chain Pressure (ECP) dryers to assess the improvement of quality characteristic of Orthodox type of tea produced using three different standards of leaves. Selected Leaf standard percentages were 40, 50, and 60% and two different drying temperatures of 205^{o}F as the control and 230^{o}F as the treatment were selected in this study. Pilot scale Orthodox rollers with a capacity of 15 kg withered leaves were used to undertake Pure Orthodox manufacturing process. Experiment was conducted in triplicate for each leaf standard at two different drying temperatures. Dried tea samples were separated into seven grades namely OP, OP1, PEKOE, FBOPF, FBOP, FBOPF1 and OPA. Graded tea samples were organoleptically assessed for their liquoring properties such as infused leaf color, liquor color & strength, quality and the appearance of graded tea by professional tea tasters' in Colombo. Results revealed that there was no significant difference in liquoring properties of made tea produced at higher drying inlet temperature against dryer temperature of 205^{o}F for three different leaf standards. It indicates that higher inlet drying temperature does not influence the overall quality of the liquor. However, a trend was observed for tea produced at 60% leaf standard which gave better liquoring properties at 205^{o}F than the higher inlet temperature. Therefore when the leaf standard is good (60%), maintaining higher inlet temperature for drying has not gained advantage to produce tea with better liquor quality. The appearance of OPA, PEKOE, FBOP and FBOPF grades showed a significant difference when the leaf standard was 40% at higher inlet temperature of 230^{o}F. The appearance of OP, OP1 and FBOPF1 grades was not showed a significant difference at higher inlet temperature for all three leaf standards. Therefore better appearance can be achieved by maintaining higher inlet temperature when the leaf standard was poor around 40%.

Supervisor/s: Prof C.S. De Silva and Dr. Botejue

ABSTRACT NO: CE101

Sensitivity of the ICTAD Price Fluctuation Formula Procedure for the True Material Price Fluctuations in Construction Industry

S. A. Y. B. Jayasinghe and C. S. Alahakoon

Department of Civil Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
ybhathiya@gmail.com / alahakooncs@gmail.com

Currently, in Sri Lanka, construction industry uses a price adjustment (PA) technique for price fluctuations introduced by the ICTAD known as the "ICTAD formula method for adjustment to contract price due to fluctuation in prices". The prime objective of any price fluctuation formula is to allow a certain degree of flexibility to respond the price fluctuations. However, some clients and contractors of long term construction projects experience that this general procedure has some uncertainty when used to calculate the price fluctuations. This issue arises basically due to the non-conformity of the price indices (PI) and uncertainty of the fundamental assumptions on which the ICTAD formula derivation is based on. Therefore, this report would study on the degree of sensitivity of the ICTAD price fluctuation formula method with the true material price fluctuation condition.

In this study, four different selected construction projects are evaluated separately in terms of ICTAD formula PA and conventional PA for seven different fluctuation scenarios including one realand six hypothetical. Real fluctuation evaluation was carried out under data analysis and this revealed the percentage of over-estimation of PA computed by ICTAD formula comparative to the true PA. Hypothetical fluctuations were evaluated under the sensitivity analysis and this demonstrated the effect of various price fluctuation environments on the ICTAD formula compared to true price fluctuation. Also, this sensitivity analysis argued the assumptions of the ICTAD formula derivation. Both these analyses pointed that the ICTAD price adjustment seriously depended on valuation assessed, input percentage, PI and fixed coefficient (FC) - 0.966. The latter directly depends on the cost adjustment factor (CAF) and rest adjustment factor (RAF). The use of a fixed value of CAF (15%) in the formula is not suitable since the variable profit margins (normally 15-35%) with front end and back end loadings which affected to the FC. Also, the analyses found that the two basic assumptions of uniformly distributed input percentages and 80-20 conceptual behaviour are invalid. Furthermore, the PI published by the ICTAD does not reflect the true prices in the actual market. The conventional PA is based on the quantity of inputs and change of cost and therefore, it is free from errors due to the input percentages and PI. The sensitivity analysis found the variability of the ICTAD price adjustment with respect to the valuation assessed and the different PI. Also, it convinced the use of the valuation assessed for the PA calculation in the ICTAD formula lead to inaccurate amounts.

The combined effect of all these factors are statistically analyzed using the gathered data to propose a modified FC which can address the shortcomings of the current ICTAD formula FC - 0.966. At the end of this study, a modified FC of0.757 which allows CAF up to 51.2% and RAF up to 12.6% is proposed using the linear regression and the weighted average basis, which can be used in the ICTAD formula. This coefficient models the true price fluctuation more closely than when calculated using the current 0.966.

Supervisor/s: Eng. L. S. S. Wijewardena

ABSTRACT NO: CE102

Suitability of Crushed Construction Waste in the Production of Concrete and Mortar

M. A. N. Perera, D. A. T. H. Deiyagala and P. G. N. Priyadarshani

Department of Civil Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
anushanadil@gmail.com, 0714314690

The rate of construction and demolished waste have been considerably increased over the last few years in Sri Lanka. Therefore, it was intended in this study to examine how to manage and reuse the crushed construction waste in order to reduce their negative impact on the environment. As such, the aim of this study was to determine the characteristics of crushed construction waste such as demolished concrete waste, ceramic tile waste and demolished block waste for the production of concrete and mortar.

Physical properties of Demolished Concrete Coarse Aggregate (DCCA), Demolished Concrete Fine Aggregate (DCFA), Demolished Block Fine Aggregate (DBFA) and Ceramic Tile Coarse Aggregates (CTCA) were tested and results were compared with Natural Aggregate (NA). Concrete and mortar sample were produced by partially replacing demolished aggregates in 30%, 60% and 100% ratios. CTCA based concrete was produced by replacing only coarse aggregate. In addition, engineeering properties of Demolished Concrete Aggregates (DCA) and CTCA based concrete were examined and results were compared with Natutal Aggregates Concrete (NAC). Finally it was possible to identify that the most suitable mix proportion of DCA and CTCA based concrete. Furthermore, DCFA and DBFA based mortar were produced and engineering properties of mortar was compared with Natural Aggregate Mortar (NAM). Then best replacement ratio of DCFA and DBFA was selected.

The results demonstrated that the physiclal properties of particle size distribution, bulk density, specific gravity and water absorption in DCCA, DCFA, DBFA and CTCA have made a positive impact on using them as replacments for NA. The properties such as workability, compressive strength, tensile splitting strength and flexural strength of concrete were also invesitigated. Evidently, the results indicated that DCA up to 30% and CTCA up to 60% could be replaced for production of concrete. Furthermore, properties such as compressive strength, flexural strength and water absorption of hardened mortar were investigated. Results regarding the properties of mortar testing have conformed that DCFA and DBFA up to 30 % could be replaced for the production of mortar. Cracking susceptibility test was done in 30% replacement of mortar and there was no surface cracking in any sample. Cost analysis results illustrated DCCA, CTCA, DCFA and DBFA were more economical than NA by 60%, 57%, 71% and 63% respectively. In addition, DCA and CTCA based concrete was more economical than normal concrete by 5 %. Also DCFA and DBFA based mortar was more economical than normal mortar by 5 % and 4 % respectively.

Hence, the conclusion of the study is that DCA and CTCA are suitable as a replacement of natural aggregate for production of concrete. In addition, DCFA and DBFA are suitable as a replacement of natural fine aggregate for production of mortar.

Supervisor/s : Prof. T. M. Pallewatta, Eng. M. N. C. Samarawickrama, Eng. D. P. M. B. Thibbotuwawa

ABSTRACT NO: CE103

Investigation the Properties of Fibre Reinforced Concrete

P. G. C. S. Ariyarathna and S. H. T. Bandara

Department of Civil Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
chathurisubodhi@yahoo.com, tharindu.bandara@gmail.com
0772253968 and 0713504139

Out of several building construction materials, concrete is the most popular and versatile material all over the world due to the fact that it can be fit into almost any shape, size and cheaply available at most of the locations. But this has some drawbacks such as overweight, corrosion, plastic shrinkage etc.

Composite materials are gaining much attention as it can be addressed to most of the drawbacks of conventional reinforced concrete. The aim of this project is to investigate the properties of Fiber Reinforced Concrete as an alternative material for conventional reinforced concrete. To achieve this set of laboratory experiments were done with the aid of new test apparatus.

To test workability of Fiber Reinforced Concrete, two test apparatus known as V- funnel and U-Box were fabricated. These tests exhibit that adding Carbon Fiber decreases the workability of mixes except piling concrete. A test panel was used to test plastic shrinkage cracking according to the ASTM C1579-06. The test was performed for Trial mix 3 and exhibits that plastic shrinkage cracks tend to close after one hour from the beginning of the test. Drying shrinkage was tested with the aid of pre-fabricated moulds of size 500mm x 100mm x 100mm which were available in the laboratory. This resulted in 2 mm reduction in length for mix 1 and 1 mm reduction in length for other mixes. As tensile strength is a major concern in concrete, Four Point Load Test were carried out to determine the maximum load that can be applied to the fabricated beam for a respective mix proportion and the test results were used to determine the ultimate tensile strength through stress distribution analysis.

Ultimate tensile strength was determined for several mix designs and a factor of safety was introduced as a precautionary measure. Out of these mix designs trial mix 1 was selected for design calculation and cost analysis. Ultimate tensile strength of the selected mix design was taken into consideration and a singly reinforced beam section was evaluated to compare the reinforcing area needed without fiber reinforcement and with fiber reinforcement. Finally, the cost for conventional reinforced concrete section and fiber reinforced concrete section was calculated to determine the economic feasibility of the two materials used with the considered ultimate tensile strength.

Four point load test and stress distribution analysis shows that the tensile strength was increased by a 50% of conventional reinforced concrete and this results in reducing the preferred area of steel for a particular section by 25 %. Rate per $1m^3$ of normal concrete is Rs.36766.03 and for fiber concrete (for trial mix 01) is Rs.34067.80. This results in reducing the cost by more than7% of the original cost. This implies that a mix design of 2.5% carbon fiber content for Grade 25with mechanical mixing can be applied for a particular design economically and improving the properties of conventional reinforced concrete.

Supervisor/s: Mr. D.I. Fernando

ABSTRACT NO: CE104

An Experimental Study of Blast Loading Effects on Reinforced Concrete Columns

D. D. Chamara and L. K. S. Priyadarshani

Department of Civil Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
pakar@ou.ac.lk

Public and commercial buildings all around the world have become a common target of terrorist attacks in recent times. Up to now, less amount of research studies have been attempted in this area. The main objective of this study is to evaluate blast effect on reinforced concrete (RC) columns considering experimentally determined dynamic characteristics. This study involved theoretical calculation of the characteristics of blast according to Unified Facilities Criteria (UFC) and computer simulations as the non-linear pressure-time history analysis by using the SAP2000 version 15. The study involved with experimental activity which is blast explosion has done for the RC column model series to show accuracy of above techniques with actual results.

In this study 4 sets of 225mm square and circular RC column series was casted and subjected to air blast loading and measured strain and acceleration of columns by using strain gauges and acceleration gauges. For this experiment TNT (Trinitrotoluene) used as explosion material. The finite element program SAP2000 version 15 was used to model column sections. ACI 318-05/IBC2003 was used as a design code with in SAP2000. For the response calculations, guideline of UFC 2008 published by US Army was used. Experimentally used charge weight and stand-off distance were applied for calculation and response pressure-time history was calculated.

The experiment was done for four blast scenarios of 1.5kg and 2kg with constant stand-off distance of 4.5m. As the results the SAP2000 analysis, theoretical calculation and experimental result analysis were show approximately same results. Therefore, the method used in this research work can be used for assessing vulnerability, damage and residual strength capacity of building frames and component elements subjected to near field blast events.

The experimental results illustrate that strains of circular shape columns are higher than those of square shape columns. Hence, blast loading effects on columns were differing with its geometrical properties and the geometric properties govern the structural response than the aero dynamics effects of the columns. In the experiment, there were not identified any significant blasting effects such as cracks, demolishing or toppling of columns. When charging weight is increased, peak reflected over pressure also increases. Further, peak reflected over pressure decreases with the stand-off distance. Study confirms the validity of UFC based theoretical blast load calculation for air blast.

Supervisor/s: Dr P.A. K.. Karunananda

ABSTRACT NO: CE105

Investigation of Chloride Penetration Resistance and Plastic Shrinkage Cracking of Fly Ash Blended Concrete

S. D. N. Hemachandra, M. A. R. K. B. Karunarathna and W. M. M. P. Wickramasinghe

Department of Civil Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
kanishka.mark@gmail.com

Concrete is made with combination of cement, aggregate, water and sometimes with the inclusion of admixtures. Cement acts as the binder in concrete and this may contain fly ash, which has pozzolanic properties. Fly ash in cement will bring about the increase in workability of fresh concrete, decreases the bleeding, decreases the hydration temperature, decreases the permeability of the hardened concrete, increases resistance of the concrete to the chemical effects and decreases the cost. Fly ash blended cement is available in Sri Lankan market. Since fly ash blended concrete has decreased permeability it is worthwhile to investigate whether it will provide resistance against the chloride penetration and the presence of fly ash may have any adverse effects in plastic shrinkage. Therefore, the research project investigates the chloride penetration and plastic shrinkage of fly ash blended concrete.

To access the chloride penetration the chloride ion measurement apparatus was fabricated according to ASTM C1202. To assess the plastic shrinkage cracking, the plastic shrinkage measurement apparatus was fabricated according to ASTM C1579. Concrete samples of grade 20, 25, 30 and 35 were cast according to the design of Experiments (DOE) mix design method. They were made with Type I (fly ash blended) and Type II, III, IV (Ordinary Portland Cement, without fly ash) cement. To assess the workability of fresh state, concrete slump test, Vee-bee test and compacting factor tests were performed. To assess the compressive strength uniaxial compressive strength test was performed.

Results of all the workability tests (slump test, Vee-bee test, compacting factor test) indicate that Type I cement (fly ash blended) has slightly higher workability than Type II. Compressive strength of Type I (fly ash blended) was slightly lower than the Type II (without fly ash) cement for all the Grades tested. It was found that Fly ash blended cements (Type I) has highest resistance to chloride ion penetration when compared with the Ordinary Portland Cement (Types II, III and IV). Under the supply of normal environmental conditions of plastic shrinkage test, the slightly small cracks were only visible on grade 20 concrete and hence can be concluded fly ash blended concrete have the property to reduce the shrinkage cracks as well. Therefore fly ash bended concrete has higher protection against chloride penetration and potential to reduce the occurrence of shrinkage cracks.

Supervisor/s: Dr. (Mrs) K.M.L.A. Udamulla, Dr. T.C. Ekneligoda

ABSTRACT NO: CE106

Recycling of Waste Coconut Shell as a Substitute for Coarse Aggregates in Light Weight Concrete

D. D. T. Dasanayaka and M. B. M. De Costa

Department of Civil Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
thakshi_2@yahoo.com

Coarse aggregate is an important ingredient of concrete and granite is the most widely used coarse aggregate in Sri Lanka. Due to rapid development of the construction industry there was increased depletion of natural resources of granite quarries. The project examines the suitability of partial replacement of coarse aggregates with coconut shells in the production of concrete.

In the study physical properties of coconut shells and conventional aggregates viz. sieve analysis test, specific gravity test, aggregate impact value test and thickness of coconut shells were tested in order to compare the properties and to find the suitability of coconut shells as coarse aggregate. Different concrete mixes by replacing coconut shells with and without fibers separately, as coarse aggregates in proportions of 0%, 4%, 8%, 12%, 16% and 20% for Grade 25 concrete were prepared using British Mix Design Method. Grade 25 and Grade 20 concrete are cast according to ICTAD Specifications Prescribed Method with fibres using similar proportions. Compressive strength, Tensile strength and density of concrete were measured on concrete samples.

Particle size distribution curves of both coconut shell samples were in the upper and lower limit curves for coarse aggregate. Specific gravities of crushed coconut shells lie within the range of recommended values of the light weight aggregates. The values obtained for aggregate impact test was 2.7% and found to satisfy the BS requirement. It is observed that a proportion more than 4% but less than 8% is the optimum to obtain a grade 25 concrete, conforming to required standards, both in British Mix design method and ICTAD Prescribed method. Coconut shells with fibers produce higher compressive strength than coconut shells without fibers. For Grade 20 concrete also proportion more than 4% but less than 8% gives the required strength. Splitting tensile strengths for coconut shell aggregates with fiber were greater than that of without fiber samples. Density of concrete decreased with increase in coconut shell replacement.

The results of this research suggest that coconut shell can be used as a partial substitute for coarse aggregate in concrete in applications of “non-load bearing walls” and “lintels”.

Supervisor/s: Eng. (Mrs.) M.N. Tantirimudalige, Dr. (Mrs.) K. M. L.A. Udamulla, Dr. T.C. Ekneligoda

ABSTRACT NO: CE107

Selection of a Reliable Delay Analysis Technique for Construction Projects in Sri Lanka

K. H. B. Nishanthi

Department of Civil Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
nishanthikhb@gmail.com

The problem of delays in construction projects is a global phenomenon and the delay of construction projects in Sri Lanka is no exception. Hence, identification, quantification and analysis of construction delays in Sri Lanka is timely study. Contractors frequently complain that delays have occurred due to reasons beyond their control and claim for Extension of Time (EOT) and/or prolongation cost. The Employer often does not believe that the contractor is legitimately entitled to EOT and/or prolongation cost. Hence, the analysis of delays through reliable Delay Analysis Technique (DAT) is essential for resolving delays and related disputes. Although the DATs are employed to compute the EOT, it does not seem to be widely applied in Sri Lanka. This study is focused on identifying the degree of usage of DATs in Sri Lanka and to show how they can be applied to construction projects.

The major part of the study is based on the Outer Circular Highway-North Section 1 (OCH-NS 1) Project. A questionnaire survey was conducted to solicit the information regarding the degree of usage of DATs from Engineers working for C1 and foreign contractors in Sri Lanka. Subsequently, interviews were held with the Engineers working for OCH-NS 1 Project to identify causes of delays. Six delay causes which led to 12 delay events were identified. OCH-NS 1 Project was used as the case study to demonstrate the application of DATs. The 12 delay events were incorporated into the four DATs namely; As-Planned Vs As-Built Technique, Impacted As-Planned Technique, Collapsed As-Built Technique and Time Impact Analysis Technique.

The study reveals that the overall degree of usage of DATs is about 27.5%, whereas usage is 15% and 40% for C1 and foreign contractors respectively. With respect to OCH-NS 1 Project, the allowable time extensions were computed using As-Planned vs As-Built Technique, Impacted As-Planned Technique, Time Impact Analysis Technique, and Collapsed As-Built Technique are 267, 447, 355, and 195 days respectively. The study also discusses varying advantages and disadvantages of the four DATs. Further, the four DATs which adopt different analytical approaches require different information. This study found that the projects may not have readily available information required for application of DATS. Therefore, most practitioners depend on their own experience to determine EOT rather than use DATs. It reveals that, the Time Impact Analysis (TIAs) does not have many disadvantages which other three techniques have. Hence, the study concludes that the TIA is the most desirable, and presents a guideline for its application.

Supervisor/s: Dr. D. A. R. Dolage

Abstract No: EC101

An Improved Pedestrian Tracking Algorithm for NLOS Cellular Environments

P. P .C. Lumbini

Department of Electrical & Computer Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
chalitha.lumbini@gmail.com

Pedestrian position tracking has been an interesting topic associated with many areas such as defense, navigation and sales. Global Positioning System (GPS) has been the widely utilized positioning tool in majority of these application areas. The GPS system requires line of sight (LOS) for the receiver to capture signals from a minimum of four satellites. However, with the dense foliage over the roads or due to the high rise buildings, such availability cannot be guaranteed, which makes it impossible employing GPS in many of the tracking applications. Thus, non-LOS (NLOS) position tracking is highly desired and the cellular network coverages are a good candidate to provide such alternative but less accurate position tracking solutions. Furthermore, with the advancement of the communication technologies, modern cellular systems have implemented location based services which are relying heavily on the cellular position tracking.

Cellular network based pedestrian position tracking is inherently affected by the multipath effects, fading, scattering, shadowing and noise. These adverse effects introduce errors to the estimated position. Therefore, an array of techniques is being employed for an accurate positioning by minimizing the effect of such adverse phenomena existing in wireless environments. These include database correlation, geometric, statistical and also hybrid schemes for cellular mobile positioning.

The position estimates obtained can further be improved taking the time domain correlation in consecutive estimates. However, the time correlation is not constant over a time period as the correlation decreases over the time. Almost all the existing algorithms employed for position estimation and fine-tuning ignore such correlation variations.

Thus, in this paper we propose a weighted correlation based position estimation improvement technique. Furthermore, in certain terrains, the obstacles such as buildings and mountains restrict the pedestrian movements. Hence, the information of such barriers can be included in fine-tuning the estimate, which can eliminate the estimate falling on to such forbidden areas. This can also be viewed as the utilization of the spatial correlation of estimates. A Markov chain based novel algorithm is proposed to employ this spatial correlation information in estimation fine-tuning. The proposed algorithm defines the transition of the pedestrian position in terms of a transition matrix, where the transitions to the forbidden areas are indicated by null probabilities. Finally, a hybrid scheme of the two proposed algorithms is derived in view of a more accurate final estimate.

The Matlab software based simulation results verify the estimation accuracy improvement for the two, time and space domain correlation based schemes and also for the hybrid scheme.

Supervisor/s: Mr. D.N. Balasuriya

Abstract No: EC102

Design of a Low-cost Wireless Sensor Network for Grain Store Monitoring

M. T. S. Dilshany

Department of Electrical & Computer Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
Sachithra.Dilshany@dialog.lk

Reduction of extreme hunger is among the key millennium development goals. However, the world's food production on one hand is not adequate to feed the ever growing population and on the other hand it is not evenly distributed among the consumers. Thus, two thirds of the population still suffers from hunger. At the same time the developing nations lack technological advances in their agricultural methods, hence produces products with a lower efficiency. Amidst all these, a considerable amount of the produce is wasted in the route from the field to the consumer. Aging, improper handling and transport, poor storage facilities are among the causes of such wastage.

Rice is a cereal consumed as the staple food by more than one third of the world's population and is a seasonal crop. Therefore the harvested rice during the harvest season needs to be stored for the latter use. In this process, a widely employed technique is to store rice in sacks piled up in a store. The rice stored in such a manner is susceptible to both pest attacks and also to wetting. Poor quality sheds used in this aspect exposes the harvest to rain water and fuel the problem of wetting. Wet rice immediately starts to sprout thus making it unsuitable for human consumption. Therefore, wetting can cause severe damage to the grain stores. Meanwhile, a mechanism to identify the presence of wetting and the location of wetting at a rice store is desired and it would be beneficial in eliminating further damage. Several such wireless sensor nodes are available for maize and other serial store monitoring. The properties of rice related to wetting and also the radio frequency signal transmission through rice may differ from those for other serials.

This abstract presents a wireless sensor network to be deployed at a rice store which monitors each and every sack individually and relays the information to a central node outside the storage area. Note that the rice filled sacks are piled up one top of each other, thus there exist a requirement to communicate the information captured at a middle rice sack through rice to the neighbor sack. The key element of this sensor network is a battery powered sensor node which consists of a temperature and a moisture sensor for sensing the wetting, a Zigbee module to transmit /relay the information to the neighbor sack's node and also a control unit to compile all the information captured to a message and to control the transmission. Furthermore, the rice sacks may be stored for an year. Thus it is impossible to replace the battery for a long time and a power saving mechanism is used in this sensor where the sensor transmits only in the case of wetting.

Test results verify a communication over 1m distance over *samba* rice of medium size grains with 96.36% accuracy. Also the current drawn in average is 0.24mA at normal operation and is 55.26mA in transmission.

Supervisor/s: Mr. D.N. Balasuriya

Abstract No: EC03

Document Summarization

D. M. A. P. Sachinthaka

Department of Electrical & Computer Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
dmaprasad@gmail.com

When people need to find some details, contents or even summary from a document, they have to go through the entire document. Even document has a topic, it will not describe the contents of the document. In such cases user has to look at the document and have to understand the contents in the document. When there are many definitions for a single word, it is really difficult to identify the appropriate definition that user needs. So amount of data or Information records are quantitatively became into large numbers and again it lacks the actual task.

As an example, "Bank" can be called as a financial institute, financial intermediary that accepts deposits and etc. Also side of rivers (Rivage) is also known as "Bank". As another example "resume", is a word that can be used for the CV (curriculum vitae) or application form. As well as "resume" is used as continue the work. Likewise there are many words with multiple meanings. In normal way there is no any method to rectify such ambiguities.

Moreover when there is a document with large numbers of pages, it is quite difficult to go through all pages by reading one by one. If it is not the document that user needs, time is wasting for useless work.

If automated system can summarize the whole document and can give summary of the document to the user, it will save the user's time and user will be able to gather accurate and relevant results.

To deploy application first need to select most appropriate texts by disambiguating words, names and noun phrases in document. To achieve, it can be used dictionaries, glossaries and ontologies. In this system "WordNet" is taken as resource for this task. "WordNet" is a lexical database for the English language.

According to the "WordNet" result set, mark all the appropriate words in the document to identify the positions of the identify words. It is helpful for summarize the document based on their priorities.

Then calculating weights for the selected words by using appropriate weighting method. Calculating weights is very important to select best concept behind the document. As an example "The" is an article that using for many positions in the document. Even it is used in many places it is not described the document or document content. So that we have to give low weight for "the" article. Likewise we need to calculate weights for identified word or concepts in the document.

CF-IDF weighting method is used for weighting method. CF-IDF is a content based weighting method which use for information retrieval and data mining. According to CF- IDF results it can be computing similarities among the selected words or concepts. Based on similarities we can check for best concepts such as ignoring the less similarity words or concepts, ignoring less used words or concepts, etc. Using above methods it can be checked for best concepts.

After that give content idea of the document according to best concept and summarize the document. In addition give web search results according to the content idea of the document.

Supervisor/s: Dr. A. P. Madurapperuma

Abstract No: EC104

Energy Saving Automatic Light Controller

D. U. A. Fernando

Department of Electrical and Computer Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
ushan.aruna@yahoo.com

The main objective of my Project was to design an intelligent energy efficient lighting controller based on the integration of Daylight harvesting and Human occupancy detection technologies. Automatic controller leads to take greater advantages in eliminating unnecessary power consumption, improving visual impact of the human against over & less lighting conditions, improving versatility and the user friendly mode selections.

This is an environmentally friendly system that saves energy by keeping unoccupied rooms unlit and maximizing the use of available natural light. It is capable of changing the luminance level of the 230V AC dimmable artificial lamp during day and night time automatically with versatility. There are two operating modes called automatic and manual displayed on the LCD. Under automatic operation, the system senses luminosity inside a room and dims the lamp to maintain a prescribed level of illumination inside the room. In the long-run, this controller provides control solutions that reduce energy costs and extend lamp life.

This controller becomes self-configuring lighting control system solution for bedrooms, office rooms, seminar halls and small perimeter areas. For the accurate daylight harvesting and the no flickering effect of the bulb, only daylight should be allowed to be incident on the LDR and light rays coming from artificial bulb to be controlled should be prevented to be occurrence on the LDR. Occupancy detection sensor pair can be kept on a mechanical stand or wall mounted bracket which has height adjustment. Located height may be suitable to set as 1.25 meters from the floor. But it may change on the height of the users.

Main features of my system are Day light harvesting with ambient light detection to create the total light balance, Human occupancy detection, Automatic controlling mode selection, Manual controlling mode selection, Manual Bulb intensity decreasing option and the Manual Bulb intensity increasing option.

Lakduino-Uno (ATmega 328 Microcontroller) is the main controller and there are lot of circuits such as Zero-Cross detection, AC dimmable lamp dimmer, PIR sensors, LDR circuit, LCD display circuit, Control button circuits, control signal LED circuits and the power supply interfaced with it.

Supervisor/s: Mr. C.J.S.A.H. Perera

Abstract No: EC105

Intelligent IAAS Management for Dynamically Expandable Cloud Infrastructures

C. W. S. Goonetilleke

Department of Electrical & Computer Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
charitha.ws@gmail.com

Cloud computing involves delivering hosted services over the Internet. These services are broadly divided into three categories: Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS).
IaaS is depending on the Infrastructures that physically available or either virtually implemented over on hypervisor, such as Hyper-V, Xen, KVM or VMware, that runs virtual machines as guests.

IaaS clouds often offer additional resources such as a disk image library, raw (block) and file-based storage, firewalls, load balancers, IP addresses, virtual local area networks (VLANs), and software bundles. IaaS-cloud providers supply these resources on-demand from their large pools installed in data centers.

To deploy their applications, cloud users install operating-system images and their application software on the cloud infrastructure. In this model, the cloud user patches and maintains the operating systems and the application software. Cloud providers typically bill IaaS services on a utility computing basis. So cost reflects the amount of resources allocated and consumed.

But when considering the existing virtualization solutions, they are highly depend on single host platform and if platform get fails, whole virtual nodes became down. So currently IaaS clouds focusing on individual node expansion of cloud which can be done by using physical low cost computational nodes as cloud elements. In physical computational approach,network administrator has to configure each node after adding to the cloud. Also when cloud consists with large number of nodes such as 500+, single network administrator cannot maintain the cloud individually and there is no mechanism to identify load patterns and change state (Sleep, Wake or switch to another worker role) of nodes according to forecasted demand.
The project is to develop a cost effective, real-time, intelligent solution for replace current manual process of physical node IaaS configuration and management task of network administrator by minimizing above drawbacks. Also solution will be able to awake or sleep cluster nodes automatically according to demand without physical interaction of user by replacing current manual management task of system administrator and deploy or remove software cartridges on nodes automatically once user upload them in to server remotely. Cloud can intelligently detect load patterns and configure nodes automatically to deliver maximum achievable performance. Also cloud has management portal that is running on management node to manage load balancer and deploy or remove deployment artifacts from nodes according to user requests.

Agent communication is used to communicate with the management node and workers to cater above facilities. In current implementation, Linux based virtual PC is used as management node and Management agent running on it while Raspberry PI devices with Arch Linux is using as worker nodes. Each and every worker agent in the Raspberry Pi cluster is communicating with Management agent by using communication messages.

Supervisor/s: Dr. A. P. Madurapperuma

Abstract No: EC106

Neural Network Based Prediction of Climate Change Impacts on Water Level in Kala Oya Basin

T. Theebavathani

Department of Electrical and Computer Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
ttvathani@gmail.com

Reservoirs and river basins are the most significant components of water resource management, which provide effective multi-purpose water storage that is employed for irrigation, water supply, hydropower, and flood-drought control. To most effectively use this stored water, it is essential to optimally monitor the reservoir level to obtain the desired performance. The lack of future information regarding the inflow, water storage, and parameters that influence the reservoir level such as amount of rainfall, water release, evaporation, soil moisture, geomorphology of the watershed, and infiltration, represent the uncertainties that must be considered in water resource operation.

Many irrigation systems in the dry zone of Sri Lanka have faced with water shortage problem. Water shortage has negative impacts on crop intensity and yields and finally on the income of families living in these irrigation schemes. Prediction techniques that are used are different as per purpose, data availability and physical characteristics of the system. Furthermore, uncertainty is there in hydrological parameters (rain fall, water level, evaporation), and to deal with this a proper prediction method is needed because hydrological parameter is of nonlinear character and changes over time (time series). The aim of this project is to develop a prediction model of climate change impacts on water level in the Kala Oya river basis using neural network.

A feed forward neural network with back propagation algorithm is used in this project due to its characteristics of solving complex problems by modeling nonlinear input and output relationships. The main input parameters are rainfall, temperature, evaporation, and water level of the reservoir. Climatic parameters are from Meteorological Department and future climate predictions are from the PRECIS climatic forecasting model of Meteorological Office at UK. The output is future water level in Kala Oya river basin. In this project, MATLAB (R2013a) tools are used to predict water level in Rajanganaya reservoir. Weather data between 1952 and 1992 are used for training the neural network, while data between 1993 and 2002 are used for validation, and data between 2003 and 2013 are used for testing.

The system will be helpful to resolve the water shortage problem in Kala Oya basin through proper planning and this forecasted climate predictions will significantly contribute to enhancing economic opportunities, particularly for the national agriculture, fishing, forestry water and energy sectors, as well as it brings social benefits.

Supervisor/s: Dr (Mrs) K.G.H.U.W. Rathnayake, Dr (Mrs) B.C. L. Athapattu

Abstract No: EC107

Power Saving Office Automation System

S. S. Morapitiya

Department of Electrical and Computer Engineering ,Faculty of Engineering Technology
The Open University of Sri Lanka
morapitiya@yahoo.com

This proposed system is designed for the office to control lights and fans automatically because most of officers forget to switch off lights and fans after their work.

This new system is designed to control the lights and fans in an office. In this project it is proposed to solve some common problems. According to this new system no need of extra wires to control the fans and lights. The data is sent over existing power line using X-10 protocol to control those devices. This automation system will be very important for an office as it helps for power saving.

This proposed system is very flexible as it can be operated in many ways. First one is to set a fixed time to switch on and off the devices.

Normally in an office working time duration is from 8.30 a.m. to 4.30 p.m. Therefore we can set the time to switch ON all lights and fans at 8.30 a.m. and switch OFF 4.30 p.m. If we need to switch on the lights around the building after 6 p.m. and switch OFF 6 a.m. that can be set as fixed. Second one is setting the time manually. If an officer want to stay in room at 8.30 a.m. to 12.30 p.m. and can be set the time manually for switch ON and OFF the lights and fans. X-10 is a communication protocol designed for sending signals over 230 V wiring. X-10 uses 120 kHz bursts timed with the power line zero-crossings to represent digital information.

This new system is designed for every fan and light which has a unique address and also every device has a sub unit. These sub units will control fans and lights. This system has only one main unit with computer. Every sub unit is connected with this main unit. Using a computer we can input the data to the main unit. Main unit will control all sub units and the data is sent through the power line.

Main advantage of this system is to save power and can reduce the electricity bill. Other advantages are no need of extra wires to control those devices; it allows addresses up to 256 devices, no need of new constructions to the power line, and good security for the building.

Supervisor/s: Mr. C.J.S.A.H. Perera

Abstract No: EC108

Smartphone-Based Activity Recognition Model (SBARM)

L. Elilvany

Department of Electrical and Computer Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
rekaelil@gmail.com

User context awareness is one of the emerging properties used in mobile applications and services in the area of ubiquitous computing. Human activity recognition is an important area of machine learning research because of the requirement the real-world applications. This research which is in progress aims to use context awareness data from Android mobile devices in activity recognition.

The capability to recognize human activities is useful in different sectors such as healthcare, eldercare, target advertising and in many research platforms. In the healthcare sector, the results can be used to reduce the need for humans to manage individuals who will be unable to live independently and need assistance due to cognitive impairments. And also the results can be used in conjunction with pattern recognition to determine changes in a subject's routine. Researchers in many disciplines, from marketing to healthcare, will always be interested in collecting activity data which can be useful for people studying physical therapy, psychology, fitness, and much more. In advertising, targeting based on user's current or frequent activities, helps to display advertisements that are even more relevant to that user.

Great deal of research has been carried out in activity recognition using wearable sensors and mobile devices. But wearing sensors on human body can bring inconvenience and discomfort to the user. To avoid this mobile device can be used as an unobtrusive device in activity recognition. Even there has been several researches done using mobile devices, relatively little practical work has been in the area of applications.

With this motivation, this project investigates the ability to recognize activities such as Idle/phone-not-on-person, walking, running, jogging, Going up stairs, going down stairs, travelling/driving and shopping through a smartphone.

The data collection has been carried out using the smartphone sensors over a period of 4s time window. Due to the limited memory availability of the smartphone, the collected data has been sent to the server which provides the storage and processing. Then it has been pre-processed in order to eliminate noise and redundancy and the time domain features such as Mean, Variance and Standard deviation are extracted. Then the data is split into training set and test set. The training set is used to train the activity recognition algorithm and the test set is used to evaluate the recognition algorithm after training. The extracted features are the input data needed for the Hidden Markov Models (HMM) which is used in order to construct the activity recognition model.

The recognized activities can be viewed in android dashboard application integrated with any applications.

Supervisor/s: G. S. Nadeera Meedin

Abstract No: EC109

Smart Bliss Board System for Multiple Disabled

I. R. K. Seneviratne

Department of Electrical & Computer Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
irkseneviratne@gmail.com

This paper presents a teaching and learning mechanism of multiple disabled in the world (such as blindness, deaf, mental retardation, vocal disabled etc.).They have very few mechanisms to learn (Braille system, Sign language etc.).In this paper consider about the category of the multiple disabled named "Cerebral Palsy". Cerebral palsy is a disorder with movement, difficulties with thinking, learning and feeling. Most of cerebral palsy is suffering a person in unable to read, write or speech. Therefore, they are unable to express their ideas naturally to others. On the other hand, they are unable to perceive others ideas as well. These communication barriers caused them to their teaching and learning. The Bliss symbolic language board is a concept for a learning method for the Cerebral Palsy disabled. At present, the Bliss symbols are printed on hard board. When using this printed Bliss board in the classroom, the teacher or tutor must concentrate each multiple disabled child separately to understand his or her expression using Bliss symbols. This is the main problem in their teaching and learning of multiple disabled (with Cerebral Palsy or handicapped) children/adults. Basically, they use a head attached stick for touching each bliss symbols on a Bliss board. This is a difficult task for them to use this Bliss board and also multiple disabled children/adults unable to use new technology such as send emails due their disabilities.

Literature survey found that the other similar systems for Bliss symbolic language learning are also difficult to use a disabled persons because they unable to access modern devices such as a computer or mobile phones directly, due to their disabilities. But in this research mainly consider about the accessibility of modern technology for the disabled and how they can easily interact with the new technologies.

Proposed Smart Bliss Board system is running on a desktop application and a smart phone application with a head movement tracking device. The proposed system is very interactive than the existing printed Bliss symbolic board because the users (disabled children or teachers) can select each symbol by using moving cursor. In this project use a device for controlling the cursor movement on a computer screen using a head attached accelerometer device. After pointing or touching Bliss symbols, then the device automatically lookup and convert to the English/ Sinhala/ Tamil language text and voice of the pointed Bliss symbol and then users can send the message to the teachers. The teachers can use a desktop a PC, tablet PC or a mobile phone to response the message of the users. When using the proposed systems, teachers do not need to interact with Bliss symbolic words. They can easily type required message using English/ Sinhala/ Tamil language, then it will convert to the Bliss symbolic language sentence and send back to the users.

This Bliss symbolic language application designed for simplifying the reading, writing for people with cognitive, language, and learning disabilities or literacy problems. That is most suitable for multiple disabled. And also this application can be used internationally among many users and teachers those who do not speak the same spoken language.

Supervisor/s: Mr. C.J. Basnayakage

Abstract No: EC110

Wireless Tire Pressure Monitoring System

M. K. K. Ranasinghe

Department of Electrical & Computer Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
ranasinghe6@gmail.com

Tire pressure is a critical factor in the safe operation and performance of a motor vehicle. Over-inflated tires often result in unnecessary tire wear, reduced gas mileage and low vehicle performance and vehicle safety. A tire pressure monitoring system monitors air pressure inside the tires of a motor vehicle, and generates a signal indicative of the tire pressure in each of the tires to increase the vehicle performance and safety. Most tire pressure monitoring devices are fixed inside the tire, so that it is difficult to maintain and may damage during the deflation.

This proposed tire pressure monitoring system has mainly two parts: tire side module and the dash board side module. Both modules have a microprocessor and a transceiver. Tire side module is mounted outside of the tire, on the rim of the wheel so that it will not be damaged when inflation. It uses an analog air pressure sensor to monitor the tire pressure and it is calibrated before use. That data is transmitted wirelessly through the transceiver to the dashboard side module and displayed. Transmission of data is done periodically to save power.

Vehicle ignition switch produces a signal indicating that the vehicle is started. When the vehicle is not moving, all components are kept in standby mode. This signal is sent to the tire side module through the transceiver of the dash board side module. This will wake up the pressure sensor and the measured data is processed and analyzed by the microprocessor. If the levels are deviated from the required pressure level, a warning signal is generated and displayed in the dashboard.

In this project, a 13000mAh rechargeable battery is used as the power supply, which will work 24 hours per day and will last for a duration 6 months without any replacement. As an alternative, a mini round type solar panel can be attached to the tire side module. After mounting the tire side module, it is necessary to carry out wheel balancing to compensate the additional weight of the device. All components used in this project were selected to adhere the disturbances occurred in harsh environments.

This proposed tire pressure monitoring system will present several advantages over the existing methods such as low power consumption, easy maintenance, low cost, high accuracy, high reliability and applicability in tube type tires as well.

Supervisor/s: Mrs. H. Pasqual

Abstract No: EC111

Smart Medi Wallet

J. M. N. Wijesooriya

Department of Electrical & Compute Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
jmnwijesooriya@gmail.com

The doctor hands you a prescription for antibiotics. The pharmacist hands you the packets of pills that you're supposed to take for the next few days. But after a few days of taking the medicine, you forget the dosage and taking medicine at right time. To get maximum benefit from your medications, it is important to take them exactly as prescribed by your doctor. In fact, your chance of a better health outcome improves when you take your medications as directed. But some people who take more than one drug still do not take one or more of their prescriptions according to their doctor's instructions. Nowadays, according to the complexity of lifestyle with their day today work, people postpone of getting medicine at right time. If a user has to take one or more drug types (tablets, capsules, syrups, creams etc.), user must remember about which drug, what time, which dose for a day to be taken, which will be a bothersome task.

Smart medi wallet is a medicines keeping wallet which is smarter and solves the so called problem. The wallet assists the user in many ways such as sending reminders, as a storage device etc. The smart medi wallet will sync with the smart phone. Through this smart phone application user can update wallet contain medicines and their using time and dosage easily. If you forget to carry the medi wallet, it will automatically alert you via your smart phone Likewise, this wallet reminds you to take medicine at correct time. Ultimately it will improve your health outcome when you take your medications as directed.

When considering similar systems act as reminders, most of them are not usable to patients. Most of them need ICT literacy. This system mainly consider about the accessibility of the patients. This wallet focuses on the patients who are advised to take pills regularly.

Smart medi wallet is designed to be expandable, accessible, usable and portable. If a user forgets to carry the medi wallet, it will automatically identify that and will alert to your smart phone and will indicate the location that you forgot that wallet. Wallet displays time details of the medicine to be consumed as which medicine, which dose and correct time on LCD. And also can easily to find correct medicine stored compartment by indicate the seven segment display with dosage value which use at correct time. Establish communication with the smart phone and wallet via Bluetooth technology. Through this smart phone app, user can maintain details of medicines and can set reminding methods to getting medicines like vibrating, voice reminding and displaying alert. Initial prototype of the Smart medi wallet is implemented on Windows phone and easily can adapt to other mobile platforms.

In order to maintain the medical storage environment, temperature sensors have been used and the materials to be used in insulating the medicine at the commercial product have been proposed. As a result the heat generated from the circuits would not affect the medicine. In order to make the system cost effective the costs of each element in use have been considered. This medi wallet system will improve user health outcome when you take your medications as directed.

Supervisor/s: Ms. Nadeera Meedin

Abstract No: EC112

Learning Mathematics with Computer Games

S. N. Thilanganie Rajika

Department of Electrical & Computer Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
raji.snt@gmail.com

Mathematics is one of the core subjects in the school curriculum. According to government regulations passing mathematics is compulsory in the Ordinary Level (O/L) examinations. Yet according to government statistics only 57.23% students have passed in Mathematics in the year 2013. It was identified that one of the major reasons for the high failure rate is that the students do not understand basic mathematics concepts very clearly and therefore they are unable to apply the knowledge when required. According to Educational Learning Theories basic mathematics concepts have to be taught to students at very early stages of their education.

Therefore in this project we propose to teach basic concepts in mathematics namely addition, subtraction, multiplication and division for grade 3 students with a new approach. Considering their playful nature and the attraction towards computer games we have developed this system in the form of a computer game named Maths house.

The Maths house computer game is developed based on the learning objectives of Bloom's Taxonomy. These objectives outline six categories of educational objectives along a continuum from more concrete to more abstract, from lower order thinking skills (knowledge and comprehension) to higher order thinking skills (application, analysis, synthesis, and evaluation). These levels define how well a skill or competency is learned or mastered. These levels of Bloom's Taxonomy are covered and completed in this Math House Software Program.

The system was developed using **jMonkey framework**. The game framework is developed to be a set of tools for the game play engine that is created by the game play designer. It consists of an interface for the communication with the framework and a basic tool to create all the surroundings of the game. It is object oriented and MYSQL control system database is used.

The implementation consists of two major components, a Math House game and Math House web application. In this Math House game there are two categories of players' namely new players and already registered players. New players are required to register with the system while the existing players can proceed with the game from the level he/she stopped. A user can select the module to play out of the categories of addition, subtraction, multiplication and division. Each module is sub divided into different levels and each level consist of 15 questions categorized as easy, medium and hard type of questions. If a level is completed with all accurate answers an additional bonus level will be given to the player. A web report will be generated describing how the student performed at each level which will help a teacher to access the student performance according to Blooms taxonomy.

Evaluation of the system was done through a questionnaire basically distributed among a sample of 20 teachers. According to the feedback given it was identified that the Math House Software game is an effective tool that can be used for all types of learners in this age group. More strength was identified for those who are attention deficit and lack of motor skills. The teachers were impressed about the report generated for each student after playing a game because it gives an idea about the level of learning and understanding of these concepts according to Bloom's Taxonomy. It was emphasized further, that they can use this information in teaching the students to address their limitations and strengths in learning.

Supervisor/s: Dr. D.D.M. Ranasinghe

Abstract No: EC113

Pre Meal ordering Service System

T. Liyanage, M. Hewage, V. Rajeendra and D. Kapurubandara

Department of Electrical and Computer Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
tharindusl@yahoo.co.uk

Pre Meal ordering Service System is a Web Application where it is integrated with the current live system which gives a unique service and enhances the culinary experience of both frequent first class and business class airline passengers to order a meal of their desire. The system creates an online platform for airline passengers to pre order their meal based on ingredients, health conscious and cooking style prior to onboard, arrival or during the transit process. Also the system facilitates with generating their own meal, gathering information about ingredients and finding out best meals based on user comments and ratings for a particular meal and for the administrators of this application to administrate the whole process of this service through an admin panel. At the moment Sri Lankan Catering Service satisfy the food and beverage requirements of all the major airlines which lands and takes off from Sri Lankan soil. Therefore this is a great opportunity to expand their business and increase their revenue.

If briefly mention about the important features of the system, it featured with automation of meal generation process which adheres to match ingredients and cooking styles, intelligence meal/ingredient suggestions, categorization of meals in order for users to locate a meal quickly, adding a newly generated meal as a variation of preexisting meal or as a new meal, meal quality reviewing based on ratings and comments, task assigning.

The business logic of the Pre Meal Order Service System will implement using ASP .net technology. The system will be programmed using C# and other technologies such as Ajax can be integrated with the system and query will be used heavily for client side validation and also to increase the customer experience of the user interface. Intelligence Suggestion problem will be solved by formulating an Artificial Intelligence problem as a search problem. Explaining more on this, in order to formulate an artificial intelligence problem as a search problem first of all you need to reduce the original problem to a search problem by identifying an initial state and a goal state. And the solution to a search problem can be found by reaching the goal state from the initial state that is a solution for the search problem is a path from initial state to goal state and the solution for the original problem is either the sequence of actions associated with the path or the description of the goal state.

Supervisor/s: Dr. A.P. Madurapperuma

Abstract No: EC114

Image Processing Based Non-invasive Measuring System for Porcelain Products

P. W. M. Hettiarachchi

Department of Electrical & Computer Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
bchettiarachchi@yahoo.com

The manufacturing process of porcelain plates creates a predetermined product with a certain physical geometry. It is important to identify the physical dimensions of a product in acceptable tolerance to proceed to the next stages. If there is an efficient identifying method for erroneous products in the beginning of the manufacturing process, then defective products can be easily recycled at forming stage. At the forming stage, numbers of quality parameters are measured manually. Those are foot diameter, outer diameter, centre thickness & edge thickness. In the manual process, it is time-consuming and human errors affect the measuring parameters. Hence, reduce the quality of the product.

The main purpose of the proposed system is to design non-invasive, accurate, time efficient and easily controllable system to measure parameters of porcelain products. Replacing the manual process by proposed system will reduce production wastage, time wastage, and improve sampling rate and measuring accuracy of the porcelain products.

The proposed automated system would readily detect any product with erroneous parameters and display the measured values of inner diameter, outer diameter, centre thickness and edge thickness.

"Python" is the programming language and OpenCV libraries have been used for developing the image processing algorithm. The captured image of the plate is processed using the developed algorithm and then converted to the real scale. Measuring parameters are displayed on an LCD screen.

Measured data is stored in electronic form and it can be used for statistical analysis. The system can be used for similar applications where non-invasive measurement is required.

Supervisor/s: Mr. D.S. Wickramasinghe

Abstract No: EC115

Maritime Boundary Geo-fencing

A. M. I. Mihirani

Department of Electrical & Computer Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
ineshka2u@gmail.com

Maritime boundaries around the world have been one of the major political issues from ancient times. With the time, conflicts also arise and now it has been rooted strongly. In current political scenario, it has been one of the most discussed and negotiated issues between countries. Since last few years as an island, Sri Lanka also faced similar situation with neighbor India, apart from that it is one of the most discussed issue in our foreign affairs. On the other hand, it has been a security issue so far, so to restrict unauthorized boundary crossing, we have taken security precautions such as open firing, arrests and more. However, it has affected innocent fishermen, who do not have enough knowledge about boundary issues. Therefore, a Maritime Boundary Geo-fencing system has been proposed, which alerts the fishermen, when they crossed the maritime boundary without their awareness.

There are some conventional methods to detect maritime boundary. One is based on a smart phone equipped with global position system (GPS) with a manual tracing system. Another one is based on GPS72H with the radar navigation system, which is a system where fishermen have to be knowledgeable to use the equipment to get his own position. Also radar system is operated from land and then indicated to fishermen. There are so many disadvantages in these systems, because lack of knowledge may lead fishermen to suffer, the time required to transmit the data from land may take some time and it will be a disaster if data is not sent to fishermen properly. Therefore, a system has been designed which automatically detects the boundary and indicate the fishermen. As an additional feature, it notifies fishermen 2km before the boundary that you're in danger zone.

This proposed system contains a microcontroller module, GPS module and an alarm unit. The main intention of the application of GPS module is to identify the position of the vessel while they are sailing. From the GPS module, capture longitude and latitude coordinates of the position of the vessel. It is sent to the microcontroller and it has a database of longitudes and latitudes of virtual boundary where a boundary within 2 km inside the actual boundary is considered. Then it compares the received coordinates with the database. If there is any case of a boundary crossing, an alarm is generated to alert the fishermen.

From this Maritime Boundary Geo-fencing, two tests were carried out. In the first, starting inside the boundary side the system was taken to outside the boundary very slowly and the alarm trigger point was observed. This was then compared to the actual boundary to calculate the difference between the boundary and the point, which we denote as the distance error. This was tested at different speeds from one side to the other and the distance error was measured.

This system has two advantages that, according to the GPS coordinate system it identifies the location of the vessels and indicates the dangerous situation using alarm to the boat at the same time automatically. Also there is a battery power saving mechanism. This is also a very cost effective system which fishermen can afford.

Supervisor/s: Mr. D. N. Balasuriya

Abstract No: EC116

Automated Satellite Signal Tracking System

N. A. R. Priyanka

Department of Electrical and Computer Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
rajith.nap@gmail.com

This project proposes an automated satellite tracking system that finds the target satellite by automatically positioning the satellite dish. Major concern of the project is to develop a low cost and highly efficient product for automatically positioning the satellite dish to the target satellite and to receive the peak satellite signal. It is useful to produce the maximum signal strength from the Satellite. This project is mainly focused on Digital Television Transmission and VSAT (Data Communications). Geographically synchronized satellites will be tracked by the system.
The project is designed with Satellite Dish Control Unit (SPFU and MCU), Signal Detection Unit Raspberry pi, DC motors, motor driven circuits and display unit. The dish antenna attached to the motors rotating towards the forward direction and reverse direction. Tracking will be done according to the satellite signal reception. Angle and azimuth will be calculated based on the location (longitude and latitude). LNBF (Low Noise Block Feed horn) skew will be decided by a table. To satisfy above parameters system will drive the actuators. Once above parameters satisfied, system will be verified found satellite by searching known frequencies.

In order to track satellite of interest, the mechanical and electrical subsystems provide the physical capability, while software provides easy and accurate pointing as well as safe operation. As basic method of satellite finding, satellite finder should know required satellites signal information. Satellite Signal information consist of Transponder Frequency, Symbol Rate, FEC Ratio and Polarity of the Signal. Satellites Finder (Technician) needs to feed this information to the satellite receiver (SAT Finder), Technician need to move dish until receive given Transponder Information. In addition technician can find the direction and angle of the satellite by checking satellite position chart based on geographical position.

When tuner receive correct signal, AGC voltage will be increase proportionately to the reception signal, need to measure peak AGC voltage location for peak signal. This measured voltage will be converted to a digital value and the digital value will be an input to the RPI. The display unit provides information regarding satellite signals (Strength, Quality), Motor position, LNBF Skew position and detects satellite Information. Based on the detected signals display unit will generate alarm.

Supervisor/s: Dr. L. S. K. Udugama, Mr. C. J. Basnayakage

Abstract No: EC117

Dynamic Partial Reconfigurable System ON-Chip Peripheral Interfacing for SEP

N. C. Wanigasuriya

Department of and Computer Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
nalinwaniga@yahoo.co.uk

The Student Experimental Processor (SEP) was designed as a learning tool for students those who follow the computer architecture related courses. A simulator and a compiler were already implemented for this experimental processor. This project addresses the implementation of that experimental processor by integrating peripheral interfaces so that students can get a better understanding of the basics of computer architecture.

There are many vendors manufacturing microcontroller based development boards. Those development boards have limited logics that the users to get to know their product. Also the microcontrollers itself comes with variety of static functional modules. As according to the comparison with SEP development board with other microcontroller based development boards it concludes that all the other systems can't use as a teaching tool for the students to learn the computer architecture and they have more complex structure. As for the limitation of static functional modules in those microcontrollers user has to select different controllers to fulfill their functional needs.

The FPGA development board was converted as SEP based development board. The VGA controller, PS\2 Keyboard controller, RS232 serial communication controller and memory controller are integrated to this experimental processor. According to the design it dynamically loads the pre-compiled BIT files of peripheral interfaces modules as plug and play components when new hardware component plugged into the system. A simple On-Chip peripheral bus was designed to support the communication with dynamically loading peripheral controller modules and static peripheral controller modules. The VGA controller was designed as a character display controller with 640 x480 resolutions. An I/O controller was implemented to do the I/O operations with peripheral controllers. The Program I/O technique is used to operate this I/O controller by SEP. This controller contains a device management unit to manage the downloading of bit file when new hardware plugged into the system. The SEP communication software tool was implemented to PC to communication with the hardware system to do certain operations. It contains auto downloading of bit file to FPGA when new hardware is detected by system. The PIPE mechanism was used to execute IMPACT shell commands to download bit file into the FPGA and to read the status of that operation. In addition to that it will also transfer program file into SEP main memory.

By using this system user can learn how to write assembler programs to control the peripheral interfaces and study their operations. Further they also can study the real time operation of SEP. This system can be used as a Soft processor based embedded system for VHDL system modeling too.

Supervisor/s: Dr. L.S.K Udugama

Abstract No: EC118

AR Based Virtual Furnishing Using Android

A. Lalitha

Department of Electrical and Computer Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
lalithamay18@gmail.com

This paper presents the design, development and evaluation of an interactive augmented reality. The environment provides virtual furniture augmented an image of a real physical environment such as a room. Users are given the design of the interior room by dragging virtual furniture provided with a photograph of a room. Development involves a specific process as such, as planning, object modeling, navigation, and evaluation. Evaluation has been done using questionnaire survey with 10 participants it uses seven key to evaluate the criteria such ease of navigation, effectiveness of the interface and user acceptance of the developed system. Results show that all of the participants give positive feedback regarding the evaluated criteria and it proves that the objectives of the project have been successfully achieved and able to satisfy both the developer and customers. The development of real environment showed that it is possible to have a virtual furniture shop that provided full control to the user while navigating. This can give a new perspective for the user. The next step is to enhance the application by integrating avatar in order to help first time users in navigating the real environment.

Supervisor/s: Dr. A.P. Madurapperuma

Abstract No: EC119

Open-source IP-TV Solution with an Intelligent Approach

P. B. Wanigasekara

Department of Electrical and Computer Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
Padmathilaka.wanigasekara@gmail.com

This project proposes an Open Source IPTV (Internet Protocol Television) with an Intelligent Approach that provides IPTV Solution to required Customers. Major concern of the project is to develop a low cost and highly efficient product for IPTV Solution. This product will provide the service to customers like hotels, hospitals and wide area network users.

Modern days IPTV (Internet Protocol Television) comes with higher price and only as high end solutions. These solutions do not address the requirements of small Business or domestic customers. There are a few solutions which address the small-scale business sector but they are not completed solutions. This project will provide a solution for small and medium scale IPTV with low cost. Additionally, it will provide information tracking option for collecting usage statistics such as used channels and user information. Based on the collected information the system provides suggestions to service provider to the usage of the channels. Further system also offers an automatic controlling feature for power and network bandwidth usage.

Controlling customer features and updating software in the client hardware will be done by a software application. The same software application will be used for user access control as well. However, the software controlling part is very independent to the IPTV solution. Based on these facts, Project provides comprehensive solution for the medium scale and small-scale business on an affordable cost.

On the other hand, in Sri Lanka, most of the customers use analogue Master Antenna Television (MATV) solution and always lay different cable for the MATV solution. But IPTV solution uses existing IP network and no extra burden on laying cables and no extra labor cost in maintaining the cabling system.

As a complete solution, this project provides handy solution to IPTV industry. As future development, client system will be developed as a customizable solution according to the customer requirement.

Supervisor/s: Dr. L.S.K. Udugama

Abstract No: ME101

Comprehensive study of *Instron 8801* Universal Testing Machine

D. M. M. D. Dissanayaka

Department of Mechanical Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
manojadilrukshi@ymail.com

Instron 8801 system which has been developed for material testing under both static and dynamic loading conditions is available in the Open University Sri Lanka (OUSL) mechanical engineering research laboratory. However it has been found that the machine is not fully utilized up to now.

An attempt was made to fully utilize the testing equipment by carrying out a comprehensive study of the above Instron 8801 universal testing system. It was found that even though the machine has many capabilities; accessories and software were available to carry out tensile and uni-axial fatigue tests only.

The equipment is supplied with the Bluehill software for controlling the testing conditions, parameters and data acquisition during tensile tests while Fast Track (Wave maker runtime, Wave maker editor) software has been used for controlling the same for fatigue tests. The two software programmes were thoroughly studied in this work and tensile tests and fatigue tests were conducted in this study. Special attention was focused on the generation of new report templates, test templates and arranging event controls for both tensile and fatigue tests. Comparison of the observed data (ultimate tensile strength for mild steel in tensile tests and number of cycles to failure for a predetermined stress limit in fatigue tests) with the values found in the literature was done and low cycle and high cycle fatigue tests were conducted for completely reversed repeated and random stress cycles to ensure the operation of the system for all performances with available accessories.

Troubleshooting and repairing process was also delivered on this Instron 8801 universal testing system according to the requirement while conducting above mentioned tensile and fatigue tests. After the repairing process it was assured that the system is working properly without any issue for a long time period to any kind of tensile and fatigue tests for metals.

Furthermore a simplified guideline set for the accurate operation of the machine was developed. The possible improvements of the testing facilities are also suggested with the necessary accessories which are not currently available at the department. A budget report was also prepared for proposed purchasing the above suggested accessories from an Indian dealer to take an idea about financial requirement for the above improvements.

Supervisor/s : Dr. K.E.D Sumanasiri and Mrs P. R. Dedigamuwa

Abstract No: ME102

Design of a Maneuvering System for Automobiles

G. M. Nuwan N. Wijerathna

Department of Mechanical Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
nuwannishantha2003@yahoo.com

At present in urban areas, due to the compact nature, parking and maneuvering the vehicles has become a problem, mainly due to the lack of space to turn their vehicles near the houses. People have to reverse their vehicle to main roads, neighboring lands etc. to get the vehicle turned, which are illegal, can cause accidents and heavy traffic congestions and also could course unnecessary problems with the neighbors. .

The proposed system is a solution to turn the vehicle and most importantly to turn a vehicle within a limited space. The Architects, and Planning and Structural Engineers could adapt this system as an added feature in designing houses, offices and car parks to optimum use of the space.

The proposed system is mainly a mechanical design consists of an AC gear motor as the power source, gear box and chain mechanism as speed reductions, turning platform and other mechanical features.

The mechanical system is totally situated underneath (basement) the platform and set of cluster wheels are guided the movement of the platform. Motor driver which can be programme by a Programmable Logic Controller (PLC) controls the positions of the turning platform.

The complete mechanical system was designed considering strength, space allocations, economics feasibility, user friendliness, etc.

Supervisor/s: Dr. Ruminda J. Wimalasiri

Abstract No: ME103

A Computer Based Vision System for Real - Time Quality Checking of Biscuits

R. J. H. B. Rajapaksha, P. D. S. H. Gunawardana*, M. Niroshan, and G. S. S. de Silva

Department of Mechanical Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
** shehanhg@gmail.com*

Competitive market has been the market scenario over past few decades, every market compromise of perfect competition. Product quality and the product safety have been key issues in a competitive market for a long time. When similar products are mass produced the quality and the precision will retain most of the market share. So companies are tend to increase their quality controlling more and often. As per the scenario, food production industries are willing to be more hygiene controlled and keen in quality assurance, where they are moving into more effective and continues implementing in assuring the product quality, they are biased towards automation. This project is mainly focused on sorting out biscuits with the aid of a vision system to emphasis its quality.

The conventional way of sorting and quality inspecting is done with the aid of human labor. In terms of sorting efficiency and accuracy the existing system performance is lower than an automated system. Boredom and fatigue are also two key factors which cause to conventional system to lag behind. With the consideration of all above mentioned issues and problems, we developed a vision based quality checking system for biscuit manufacturing.

The image acquisition system was developed using a digital camera which was controlled by the MATLAB Image Acquisition Tool Box. The back lighting was used as the appropriate illumination technique and the noises were filtered accordingly. Then the images were enhanced, features extracted and represented using MATLAB Image Processing Tool Box. Mainly the signature and the area matching methods were used to identifying the defectives and then a rejecting system was actuated accordingly to remove the biscuits from the conveyor system through the electronic interfacing mechanism.

The experimental accuracy of the development was about 79% for the conditioned back lighting system and it can be vary with the industrial environmental parametric changes. As a whole this development compromise an increment in efficiency, reliability and quality of the biscuit production and it will be benefitted to company interns of profit generation.

Supervisor/s: Ms. P. T. R. Dabare

Abstract No: ME104

Automation of Crop Transplanting in Urban Farms

H. N. Abeydeera

Department of Mechanical Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
heshan77@gmail.com

Currently scientists, engineers, farmers and etc are trying to find new methods and technologies to increase the productivity of the agricultural products. This task becomes more critical and serious because day by day the percentage of lands which are good for agriculture is shrinking due to many reasons. As people trying to increase agricultural lands by deforestation, it massively impacts on environment negatively. Therefore solution has to come to improving the productivity by using the existing farming lands, converting current barren lands in to agricultural lands or by adapting the urban areas to contribute for agricultural production.
For the completion of the Mechatronics Product Design project, finding solutions for some of the above mentioned matters was decided. Therefore an automated transplanting machine and a conceptual design for a vertical plant growing platform were designed. When designing the transplanting machine main concern goes to find techniques to reduce the root damages and automating the transplanting process. During designing the vertical growing platform main concern goes to providing enough light for growing plants, developing an efficient vertical structure for plants and to improve the agricultural production per unit land area.

Transplanting mechanism was consisting with two axis 2D plane pick and place mechanism. A specially designed gripper was fixed into the moving axis to hold the plant and to place it in secondary growing pot. Entire system was motor driven and sensors were used accordingly to detect the pots and to position the height of the gripper system.

Vertical growing platform was designed based on a spiral structure and from bottom to top it was coned. This gives the plants growing in this structure the advantage of getting enough light for photosynthesis at most of the times and as the plants are rotating in the spiral structure it is easy to inspect plants, provide water and nutrition, and re-transplant at the right time. During the project calculations were done to select the proper belt for the conveyor and to select the motor to drive the system with appropriate power.

When developing the transplanting system and vertical growing platform, Solidworks 2010 was used as a tool to create 3D models, and when developing the control system Proteus 7.6 was used as a circuit drawing and simulation tool. Mikroc 8.2.0 and Mplab IDE v8.92 were used to develop the required program for the proposed system to run.

By successfully developing these proposed systems, possibilities may rise in urban areas to grow required plants commercially or home use in small to medium scale. Even the initial cost of building the structure of the growing platform is high it will be profitable in long run. Such systems are easy to maintain with less amount of labor force and plants may easy to access for inspection and for harvesting. Options are higher for protecting plants from diseases, insects and etc even by using fewer amounts of fertilizer and pesticides than current agricultural methods. So this new agricultural methods may help to improve the environment and to provide fresh food sources to entire mankind.

Supervisor/s: Dr N. S. Senanayake and Eng. B. G. D. A. Madhusanka

Abstract No: ME105

Development of a Double Drill Machine for Brush Manufacturing

N. S. Mallawaarachchi

Department of Mechanical Engineering, Faculty of Engineering Technology,
The Open University of Sri Lanka
nsmallawaarachchi@yahoo.com

Ravi Industries Limited established in 1962, has grown to be one of the leading manufacturers of brushes and paint brushes, in the Asian continent. The Ravi Industries Limited commenced exporting of brushes in 1975 and, in 1976 B.V Borstal fabric VERO of Holland acquired a share in Ravi Industries Ltd. With the vast experience of B.V Borstal fabric VERO, in the manufacture and marketing of brushes and the introduction of new machinery, the company was able to produce high quality brushes for the export market. In 2013, It accounted for 23.2% of Sri Lankan export income, 1% of the country's GDP, 2.4% of domestic value addition and 5.5% of market capitalization on the Colombo stock exchange.

The brush blocks are made of either plantation wood or expanded plastic. The brushes are filled with both natural fiber, such as Coco, Palmyra, Arenga, Hog hair, Horse hair and Synthetic fiber, such as PVC, PPN, etc. The brush blocks making process consists of timber (rubber) seasoning, route ring sanding, painting and drilling processes. The drilled brush block is the final product of these entire processes. The drilling specifications should be maintained according to the customer requirements. They are: diameter of the hole to be drilled in the brush block, angle of the hole, depth, position, nail hole- diameter & position, and brace hole- distance & diameter. These factors are crucial factors in brush manufacturing process and it was found that there were considerable frequencies in error of drilling holes such as incorrect positioning and angles. Therefore the objective of this study was to achieve zero complaints from customers by designing & fabricating a Double Drill Machine which would replace the existing conventional bench drill machine used for brush block-drilling process. After analyzing the customer complaints on common defects, the existing machine was redesigned and modified introducing new mechanisms such as proper clamping system to overcome problems with the existing drilling process. The clamping system introduced into the machine helped to clamp the brush block rigidly to the machine so that position will not change until the drilling operations are completely over. After fabricating the double drill machine few test trials were carried out using the new machine and compared the performance with that of the bench drill machine with jigs.

The modified machine was able to rectify some of the short comings experienced in using the conventional bench drill machine and helped to eliminate several types of errors relating to normal drilling process. The quality of brush blocks was enhanced and the customer satisfaction was improved resulting increased productivity and the efficiency of the drilling process.

Supervisor/s: Dr K..E. D. Sumanasiri and Eng. (Mrs) T. S S. Jatunarachchi

Abstract No: ME106

Automated Paper Gathering and Folding Machine

T. K. Gunawardena

Department of Mechanical Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
Thiwanka_kasun@yahoo.com

Written documents are still being used in any company even though e-documents have invaded every corner of official fields. Especially in firms like financial, legal and academic, daily thousands of letters are roaming inside and as well as all over the country for various tasks. Staff members have to consume lot of time and energy to prepare letters. When an urgent situation comes sit is a difficult task to prepare large number of letters promptly. Furthermore gathering and folding can be added considerable time to the process. However, purchasing of an Automated Paper Gathering and Folding Machine may cost a lot. Therefore preparing an efficient, meticulous, professional and accurate Automated Paper Folding Machine would be a reliable solution for the grown up problem. Thus, the machine will provide benefits to increase the efficiency of letter preparation, finishing quality, accuracy of the count etc.

Objective of the project was to design and development of a low cost, automated machine which performs gathering, folding and processing with more neat and speed. The machine consists with gathering accuracy detector, paper jam detector and preset counting system and it suppose to gather two papers and fold them into letter or half fold. The paper gathering, folding and stamping functions were automated by using an electromechanical motor driven system.

Almost all the single paper gathering and folding machines currently available in the market are very expensive. Also none of the machines found with the stamping mechanism. Initial cost for this automated system is very low and running and maintaining costs are also low.

This automated system is portable and capable of working independently without much human intervention. Selected materials for the system are also durable and the machine is less of disruptions. Therefore continuous running is possible. Also selected sensors and Arduino control board for the system are very common and inexpensive. By implementing the automated letter preparation system, staff members may be able to improve productivity. Furthermore it can be modified to fully automated system by adding the tabbing mechanism. This machine would be helpful to the staff members who deal with letter preparation in offices.

Eng. (Mrs) P. R. Dadigamuwa and Eng. B. G. D. A. Madhusanka

Abstract No: ME107

Fertilizer Application Machine for Tea Plantations

A. M. Suriyarachchi

Department of Mechanical engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
akilasuriyarachchi@gmail.com

A "Fertilizer adding machine for the tea industry" was designed and fabricated to fulfill the requirement of fertilizing young tea plants. Fertilizing of new immature tea plants is usually carried out manually. This is found to be a very time consuming and labour intensive process. As one of the major problems the tea industry is currently confronted with is lack of man power, the main objective of designing and fabricating this machine was to minimize the fertilizing time and the total man hour requirement.

The manual process of adding fertilizer to immature tea plants is done by drawing a semi-circular groove of radius 150-200 mm on the ground, around the tea trunk, which should be about 10-15 mm deep. Fertilizer is then added to the semi-circular groove made on the ground. This is a very time consuming process which may require approximately 3 man-days for one acre. The worker who uses a wooden stick to do this gets worn out very quickly as he needs to work bending and straightening his back frequently throughout the whole process. Worker fatigue is quite apparent since an acre of tea may have about 4500 plants. To overcome exhaustion and fatigue most of the workers tend to dump fertilizer around the tea plants without first scratching the ground properly. This results not only waste of fertilizer, but also an increase in the production cost. A large percentage of fertilizer which is not absorbed by the plant may even get intermixed with natural water resources creating environmental pollution.

The designed machine has a capability of addressing the above mentioned problems. It is a fully mechanical machine that depends on man power alone. Being small in size a single worker can easily maneuver it through the tea rows. The overall dimensions of the machine are approximately 420mm width and 564mm length. As the distance between two plants is roughly 610mm, the machine can be maneuvered along and between tea rows without much difficulty. It requires approximately 10 seconds for fertilizing one tea plant. Since the main fertilizer holder can be loaded with 6.3Kg of fertilizer at a time, it can apply fertilizer to 180 plants at a stretch without the need for refilling.

A major advantage of the machine is that the worker using this machine is not required to bend his or her back frequently. This eliminates worker fatigue while at the same time reducing the total fertilizing time required. Further, the fertilizer will not be exposed to high air humidity which may cause adverse chemical reactions, until it is placed on the ground. This machine is mainly suitable for low country tea lands which do not have steep lands.

Supervisor/s: Dr . H. D. Goonatilaka and Eng. W.R De Mel

Abstract No: ME108

Automated Document Sorting System

D. H. N. C. Dassanayake

Department of Mechanical Engineering, Faculty of Engineering Technology
The Open University of Sri Lanka
nuwandasa@gmail.com

With the development of technology, people started to replace machines in several activities to make their lives more comfortable. Examples of such activities include barcode readers, answer sheet checking systems, postal codes and address readers and form readers. Most of the applications use optical mark recognition (OMR) technology. Optical mark recognition is the automated pattern recognition process of grabbing the data from documents and compare with predefined templates and send information to further works. These methods usually use in commercially available OMR scanners, but it has some disadvantages. The author proposes improvements system using enhanced image processing techniques to get fast and accurate output.

The proposed OMR design is capable to identify documents using enhanced image processing techniques which are submitted by the students as their assignments to The Open University of Sri Lanka and to sort these assignments. In OUSL most of the departments give a Back cover page to attach with the assignments. The students need to put the information on the given format when they submit their assignments. The author proposed to give a new back cover page for assignments which is similar to OMR sheet. Students do not need to write on it but they only need to mark boxes related to their information.

With the above cover page design, the new OMR algorithm is based on basic boundary finding image processing techniques such as **blob detection, area and blob centroid identification.** It detects boundary of each marks and x,y coordinates of each mark. The proposed system assigns information to each mark's coordinates on the cover page. The system was implemented using MATLAB 2012 software because it is the most accurate and fastest software when comparing with others in the market. The developed system is capable of sorting assignments in to two groups that are registered and unregistered students for a particular course.

Experiments were carried out for different pattern of marks, with different marking tools (pencil, pen, and marker pen), different colors (black and blue) and different lighting conditions by using basic level webcam. The developed system detected all marked documents when the light level was between 200 Lux to 6000Lux. 200 Lux light level is approximately equal to the light level of sun rise or sunset of a clear day.

Further, the system is combined with mechanical sorting system by using serial communication technology and mechanical roller system.

Supervisor/s: Eng.W. R. De Mel and Eng. P. T. R. Dabare

Abstract No: TT101

Increasing the Effectiveness of Procurement Merchandising Processes in Brandix Intimates Apparel

K. A. I. Anurudhi

Department of Textile and Apparel Technology, Faculty of engineering Technology
The Open University of Sri Lanka
isankaanu01@gmail.com

Procurement is the acquisition of goods or services at the best possible cost to meet the needs of the purchaser in terms of quality and quantity to the right location at the right time. Procurement is one of the major parts of the production factory. To run the production lines continuously goods need to be in-housed on time. Procurement merchants are facing several problems during the purchasing process.

To achieve the production targets, procurement process need to be very smooth. So the factory lost hours need to be minimized according to the procurement issues. The lost hours are a big problem and accordingly, bottom line couldn't achieve their targets. Due to this reason, they face big problems, such as Reduce the factory efficiency, Reduce the machine operator's incentive and they are dissatisfied with their jobs, To achieve the customer delivery dates it needs to work overtime , According to delivery failures sometimes garments need to be airfreight and Decrease the Profitability.

Lost hours mainly effect to the business profitability. So, to achieve higher profit there is a need to reduce the lost hours. Main causes for factory lost hours are production issues, technical issues, stores issues, cutting issues, quality issues, marketing issues, procurement issues, sample room issues, planning issues, meetings and other matters.

Procurement lost hours happens due to internal process problems as well as due to external process problems. Some of such problems are Procurement merchant is not sending purchase orders on time, In the initial stage supplier capacity is not considered, Supplier is not delivering goods on time, Supplier lead time is not matched with the required garment delivery date(speed orders), Delivery and storing problems, Supplier is not delivering required quality goods.

Past data of Brandix Apparels – Walisara was analyzed and it reveals that the main causes for procurement lost hours are Procurement merchant is not sending purchase orders on time, Delivery and storing problems, documentation issues, Supplier's failure in delivering goods on time. At the beginning of the project the total lost hours due to procurement issues was 20% from the total production lost hours. This project is mainly focused on minimizing these issues in effectively to obtain more productivity with the best quality.

The Project has completely achieved its objectives. After implementing the solutions lost hours were reduced to 3%. Then the objectives were achieved as, the lost hours due to procurement issues were minimized by 3%.

According to the final results it can recommend that by maintaining Purchase order (PO) tracking chart can minimize the lost hours, When implement new processes goods can be delivered to the third party so that it can minimize lost hours during delivery, storing and documentation issues.

Supervisor/s: Ms. T.P.G.N.T. Alwis

Abstract No: TT102

Physical Properties of Lotus Fibres

D. P. R. S. Gunasekara

Department of Textile and Apparel Technology, Faculty of engineering Technology
The Open University of Sri Lanka
dilusha.priyasad@gmail.com

Lotus (Nelumbo nucifera) is an aquatic plant which grows abundantly in Sri Lanka. Stalks and roots of this plant contain silky fine filaments which is cellulosic. These lotus filaments can exploit as a textile raw material. To ascertain the applicability of these filaments for the development of textile products would be a great opportunity. The current project was carried out to analyze whether the properties and characteristics of these fibers would meet the basic end use requirement of textile materials. The properties and characteristics of textile product will greatly influenced by the raw material on which it is produced.
Analyzing the properties of lotus filament is a prime requirement to determine the usage as lotus fibers as a textile raw material.

For this project, lotus filaments were extruded manually and subjected to relevant testing in order to confirm their suitability in textile applications. To study the physical properties and characteristics of Lotus filaments standard test methods were followed. The major physical properties such as fibre fineness, breaking strength, moisture content and moisture regain moisture absorbency and wash fastness properties were tested. Fibre fineness was an approximation average value 23.07$^{s.}$ The breaking force and elongation were 269 gf and 3.9 percent respectively. The average modules value was calculated as 18.83. The moisture content and moisture regain values were is 10.87 percent and 12.03 percent respectively.

The water absorbance, dye ability and colour fastness properties were characterized in scoured and bleached lotus filaments. Lotus filaments were dyed with various types of dyes and it confirmed that filament had great affinity towards reactive dyes. Reactive dyed lotus filaments showed the best colour fastness properties than basic dyed lotus filaments. Compared with cotton fibres, lotus fibres have lower breaking strength values. Test results confirmed lotus fibres are very fine and longer, have a good hygroscopicity, high moisture regain and absorbency. The suitability of lotus filaments for a particular application can be determined considering the requirement of the end product and the properties of lotus filaments.

Supervisor/s: Ms H.A.A.E Perera.

Abstract No: TT103

The Effects of Fabric Weight and Stitch Density on Seam Strength of Selected Plain Woven Fabrics

P. K. M. R. Wijerathne

Department of Textile and Apparel Technology, Faculty of engineering Technology
The Open University of Sri Lanka
Anuruddika.karunathilake@gmail.com

Sewing is the most common method of joining cut fabric panels during the garment manufacture. For the construction of different seams, different sewing parameters are used. In order to obtain high quality seams, correct sewing parameters should be carefully selected. One of the important sewing parameter is the stitch density. Seam strength refers to a load required to break a seam. The breaking load is same or lesser than the required load to break an un-sewn strip of the same fabric. The objective of the research is to study the effect of fabric weight and the stitch density on seam strength of selected pain woven fabrics made of 100% cotton.

For this study three different fabrics with weights of 130 gm^{-2}, 155 gm^{-2} and 200 gm^{-2} were used. Six stitch densities 9, 10, 11, 12, 13 and 14 per inch were selected. Two different sewing machines namely single needle lock stitch and single needle chain stitch were used to make samples. All other required stitching parameters were kept constant. The used seam is the plain seam and the samples were made by using the speed of 2500rpm.

Sixty samples were prepared for each and every stitch density selected. Out of the sixty samples, thirty samples each were prepared by using the single needle lock stitch and single needle chain stitch machines. For the each fabric weight, ten samples were prepared. Out of these ten samples, five samples were prepared seam parallel to the weft direction and the other five samples were prepared seam parallel to warp direction. All together 360 samples were made to carry out this research. The samples were prepared according to the strip method described in the standard EN ISO 13935 – 1.

The prepared samples were tested by using tensile tester CRE type - TINIUS OLSEN H5KS for the comparison purposes. The necessary data was collected and analyzed separately to investigate the effect of fabric weight and stitch density on seam strength of selected plain woven fabrics. The outcome of this research could be used to design seams with better performances in apparel industry.

Supervisor/s: Dr M. E. R. Perera

Abstract No: TT104

Study on the Variations of Structural Parameters and Bursting Strength of 100% Cotton Plain Knitted Fabrics

T. D. R. Peiris

Department of Textile & Apparel Technology, Faculty of Engineering Technology,
The Open University of Sri Lanka
dilushirandika@gmail.com

Today, Knitted fabrics are used heavily in apparel industry to make outer wear, sports wear and also for intimates. 100% cotton plain knits very popular material today in Sri Lankan apparel industry. There are different types of structural changes happen during machine off state and during washing treatments or in day to day washing due to relaxation of the knitted structures. Due to this, various physical property changes may take a place in the knitted fabrics including dimensional changes. This is also resulted in changing the structural parameters continuously after the machine off and progressing washing treatments. May research papers have been found related to those changes. But, most of them are for the fabrics made from circular knitted fabrics. Therefore, the fabrics knitted from flat bed knits have a good potential to observe the mentioned changes after machine wash and during washing treatments. In this research project, it was investigated the variations of structural parameters, dimensional parameters (K-values) and bursting strength of plain knitted fabrics before and after washing treatments.

Fabrics were made with 100% cotton fabrics using flat bed knitting machine with three stitch lengths . The sample size was 25 inch x 25 inch and 90 samples are prepared to do this project. 5 samples were used for each test. It was measured the structural parameters such as loop length, course and wale densities before the washing treatments as a normal state after subjected the samples under the standard laboratory conditions. Stitch densities were calculated using these wale and course densities and based on those results dimensional parameters such as Kc, Kw, Ks and Kp were computed. Samples were washed using the standard washing process (AATCC -135) and washing was done through 5 cycles (W1 to W5). At the each wash cycle, tumble dried the sample for 60 minutes. Standard diaphragm type bursting strength testing was carried out according to the standards (ASTM D 3787) to find the bursting strengths of knitted samples before and after washing treatments.

It was found that course and wale densities increase with progressing treatments due to relaxation and changing stitch configuration and course and wale densities proportionate to stitch length^{-1}. Thus, higher course and wale densities increasing were observed from normal state to W3 and also found higher course densities than wale densities. Then, stitch length decreased with progression of treatments because stitch configuration changed and course &wale densities increased from normal to W5. Stitch density increased with progression of treatments because wales and course densities have increased. Dimensional parameter values (K-values) increased with progression of relaxation treatments. With lower and medium stitch length fabrics, it was reported higher Kc than Kw and therefore lengthwise deformation is expected. With higher stitch length fabric, the Kw>Kc and therefore width wise shrinkage is expected after washing. Kp values change because of changing stitch configuration and it makes the fabric deformation during washing. Busting strength is inversely proportionate to stitch length and relaxation treatments has no significant effect on the bursting strength of knitted samples according to the ANOVA results under 95% significant level.

Supervisor/s: Dr C.N. Herath

Abstract No: TT105

Effect of Fabric Area Density, Fabric Type and Stitch Density on the Flexural Behavior of Seamed Woven Fabrics

D. C. R. De Silva

Department of Textile & Apparel Technology, Faculty of Engineering Technology,
The Open University of Sri Lanka
dcrds2005@yahoo.com

Flexural property is one of the important factors affecting on the drapeability of fabrics and garments, which influence on the aesthetic appearance and functionality of them. After seaming, cloth components have a different flexural behavior than that in the cloth fabric without a seam. Cloth drape depends on the fabric parameters and seam & stitch parameters. This research project was focused on the effect of fabric area density (GSM), fabric type and stitch density on flexural behavior on seamed woven fabrics from 100% cotton and 65%:35% polyester /cotton fabrics.

100% cotton and 65%-35% polyester cotton fabrics were used in three different fabric weights such as low, medium and high GSM. Stitch type 301 (lock stitch) and 3 different stitch densities as low (2stitches/cm), medium (5stitches/cm) and high (8stitches/cm) were used to make plain seams in horizontal and vertical directions to warp and weft of fabric samples. Sample size was 2.5cm x 15cm and total number of samples prepared was 216 (108 for each of cotton and cotton/polyester fabrics. Seam allowance was used as 1cm. Cantilever method was used to obtain the bending length of samples with using Shirely stiffness tester and flexural rigidity was calculated using the bending length and the GSM of tested samples.

For low GSM fabrics, Cotton/polyester fabrics showed a high rigidity than 100% cotton fabrics and it has also observed the higher the stitch density, higher the rigidity. Also samples cut in warp direction showed significant level of higher rigidity than in weft direction of both 100% cotton and polyester/cotton fabrics. Cotton/polyester samples had higher rigidity in both warp and weft directions. Warp direction has higher rigidity than Weft Direction in both fabrics For medium GSM fabrics, samples cut in warp direction showed high rigidity than weft direction samples of 100% cotton fabric samples. But, in 65%-35% Polyester/Cotton medium GSM fabric samples, weft direction samples showed a high rigidity than warp direction samples. For both types of samples cut in warp and weft directions, it was also observed the higher the stitch density higher the rigidity. For high GSM 100% cotton fabrics, samples cut in warp direction showed a higher rigidity than in weft direction. Thus it was noted that higher the stitch density higher the rigidity in 100% Cotton GSM fabric samples. But, for cotton/polyester, it does not show the significant effect of stitch density variations on the flexural rigidity. Thus, samples cut in warp direction showed higher the stitch density lower the rigidity.

Supervisor/s: Dr C.N. Herath

Abstract No: TT106

Developing Composites Using Sanseveria Fibers

R. A. S. M. Perera

Department of Textile & Apparel Technology, Faculty of Engineering Technology,
The Open University of Sri Lanka
sunmperera@gmail.com

Sansevieria is an evergreen perennial plant forming dense leaves growing vertically from a basal rhizome. The fibers are extracted from the leaves that have a smooth silky surface when cleaned; it is a non-conventional ligno-cellulose fiber. The plant grows everywhere in the country and also grown in home gardens. Its mature stiff leaves are dark green in color with light gray-green cross-banding.

Fibers were extracted using different methods retting in stagnant water and dipping in running water; chemical retting and enzymatic retting also can be used for extracting fibers. Study evidenced that the stagnant water retting shows good results than other methods. In this study Sanseviria leaves were collected from the home gardens and the fibers were extracted by using the stagnant water retting method. Fresh water retting takes relatively more time. Some selected leaves were subjected to mechanical forces and then they were put to the stagnant water to remove the pectin materials. By this method it was able to remove fibers in few days. However some fibers were damaged due to the mechanical force applied for decortications.
In this study stagnant water retting method was used for extraction of fibers. The leaves were pounded and made into bundles. These bundles were immersed in stagnant water by placing a weight over to keep the entire leaves submerged for about 10 to 12 days. Then the leaves were taken out from water and rinsed using fresh water to clean the pectin materials and dried in sunlight. The extracted fibers were combed to remove the short fibers. Fibers were combed using wooden board with metal nails. Then the fibers became parallel and were able to eliminate shot fibers.

The extracted fibers were examined for different properties such as dimensions, tensile strength. moisture absorption and microscopic views were taken using an optical microscope. Length is measured using a calibrated metal scale by straightening the fiber over a flat table. Care should be taken that the fiber should not be elongated. Length was measured using 50 samples and average was taken. Strength was tested using "Pressley Tester". Pressley tester works on the principle of applying a load to the fibers which are clamped between a pair of jaws. The load being increased with movement of the weight away from the fulcrum until rupture occurs. At rupture of the fibers, release of the beam causes the beam weight to come to rest immediately. The position of the beam weight indicated the loads sustained by the specimen at rupture. Microscope photograph of the individual fibers were used to identify the fiber diameter. As an average the fiber length was in the range of 5cm to 7 cm and diameter was about 120 microns.

Fibers were treated with sodium hydroxide (NaOH) to remove lignin's, impurities and pectin's. Treated fibers were bleached with sodium hypochlorite (NaOCl) and hydrogen peroxide (H_2O_2). Treated fibers show a good appearance and texture. The cleaned fibers were dyed with direct dyes. Sansevieria fibers absorbed direct dyes well and dye with bright colours.
Those fibers were used to make a composite. To make composite we used unsaturated polyester resin with a catalyst and a metal die was used to get the final composite by applying the resin using a brush on the preformed fiber web. Fiber orientations were varied and tested to optimize the properties.

Supervisor/s: M. A. I. Perera

Abstract No: TT107

Effluent Treatment for Batik Plant

A. Prashanthan

Department of Textile and Apparel Technology, Faculty of Engineering Technology
The Open University of Sri Lanka.
arprashanthan@gmail.com

This study is about the effluent treatment of waste water of Batik Industry in Sri Lanka. Most of the manufacturers are not doing the waste water treatments because of several reasons. However it has become major problem for environment balance. Basically manufacturers are releasing the water to rivers and lakes or to the land where the plant is without doing any treatment. However it causes several hazards for the environmental conditions. For example, different types of animals and human beings are affected from the toxic materials.

Before doing the waste water treatments they should be aware of certain information including the standard testing methods that are used by environmentalists. Those essential testing methods are Biological Oxygen Demands (BOD), Chemical Oxygen Demand (COD), Total Suspended Solid (TSS) and pH of the effluent water. For these testing, there are standard APHA methods. According to the collected data by the researcher it is compared with the normal drinking water standard and made decisions. According to the results basically batik waste water contains higher concentrations of contaminants and toxic materials. These chemicals and particles will pollute the streams and rivers and as well as the soil.

There are two different geographical areas were selected in Sri Lanka for the study. It shows the effluents affect negatively giving several hazardous such as heavy metal contamination in soil and toxic organic materials in water. One place is Marawila Batik plant and the other one is Matara, Kamburugama plant. First observed the procedure they carry out and special ingredient and the dosages. Because according to them the test results can be changed. All the tests that mentioned above are done for these two places, then compared their content or remnants and analyzed what kind of hazards being around them.

According to the objectives of the project test results are issued to the manufacturers for the awareness of hazards and make a remedy for it. Then put the correct path without harming the environment and make successive production to save the environment for the future generations.

Finally standard method for the tests is obtained results. Such as, COD are 6400 and 12800mg/l, BOD are 1100 and 2840mg/l, pH are 13.8 and 10.69 and TSS are 48239 and 52757mg/l. comparatively these all the results are very Higher due to the higher chemical contents. According to the results tested waste water have more tendency to the range of alkalinity.

Based on analyzed test results of BOD, COD, pH and Solid show imbalance and toxic nature to the environment. Release without proper treatment of the waste liquor to the land or to the aquatic media generates toxic nature and too it will lead to an imbalance of the natural bodies of existing balance of the natural habitats and all the living beings.

Supervisor/s: Mr M.A.I Perera

Abstract No: TT108

Investigation of Effects of Unplanned Overtime at MAS Linea Aqua

S. T. A. Galappaththi

Department of Textile and Apparel Technology, Faculty of Engineering Technology
The Open University of Sri Lanka.
galappaththisasanka@gmail.com

Unplanned overtime is one of the major challenges MAS Linea Aqua is confronting specially in its peak production duration. The operational and front-end failures during this peak time would lead to work overtime, which is not initially planned in order to meet the delivery dates to win the customers in the challenging business environment

The main objective of this study is to identify the effects of unplanned over time at MAS Linea Aqua. To achieve this objective a particular production section was selected and studied. The occurrence and the pattern of unplanned overtime for 3 months period from January to March 2014, which belongs to peak time, were selected for the study. The necessary data was collected under three categories mentioned below.

a. Total number of styles completed and the number of styles completed with unplanned overtime
b. The total number hours worked and the total number of unplanned overtime hours given
c. Additional cost incurred due to unplanned overtime in each month selected.

As per the results, in the month of January 63% of the produced styles had consumed unplanned over time and the percentage was 28% and 46% in the months of February and March respectively. The acceptable unplanned overtime hours percentage is 3%. Unplanned over time hours percentage from the total worked hours in each month was beyond the factory acceptable level of 3%. It was 7% in the month of January, 6% in the month of February and 5% in the month of March. Additional cost of unplanned over time is also having a significant financial impact during the analyzed 3 months duration.

For the further analysis, styles which have exceeded 10% unplanned overtime against the planned worked hours has been selected for the 3 months period and analyzed the reasons for doing unplanned overtime. Based on the findings, the production failures, absenteeism and technical failures were the three main causes for unplanned overtime. A brain storming sessions was carried out to investigate the reasons for three major areas with the participation of operational & front-end teams. Finally the suggestions were given to minimize the effect of unplanned overtime at MAS Linea Aqua.

Supervisor/s : Dr M. E. R. Perera

Abstract No: TT109

An Investigation in To Identify the Effect of Seam Types Made Of Lock Stitches on Seam Strength In Selected Fabric Types

H. P. M. J. Perera

Department of Textile and Apparel Technology, Faculty of Engineering Technology
The Open University of Sri Lanka
prasangi.maheshika.perera43@gmail.com

Fabricated textile products require joining fabrics together by some means in order to fit complicated and irregular shapes. Most commonly known example will be clothing products. Pieces of fabrics are usually joined together at seams to construct these shapes. Therefore, seams are the basic element structure of any apparel, home furnishing products and industrial textiles. Good quality seams is a must for high quality garments. For the perfect fitting and look of the garment, good quality seams are essential. It is necessary to determine the most appropriate seams for each type of fabric to achieve a desired product quality. Quality reflects the performance of the apparel or textile product.

However seams of garments expose to number of stresses during usage. Due to these stresses seams of the garments tends to fail. There will be number of possible causes for seam failures. Some of these failures can be repaired, and some cannot be repaired. Failures at seams make a garment unusable even though the fabric may be in good condition. The seam failures during usage of the garment are unacceptable.

Hence during the research, a comparison of seam strength for three widely used seam types namely Plain seam, Lapped seam and Welt seam on garments made of lock stitches were carried out using ASTM D1683. These seams were developed in both warp and weft directions and under three different fabric thicknesses using 100% cotton plain weave woven fabric in order to see the appropriateness of these seams in various applications.

According to the test results, out of the three seams, Lapped seam had the highest strength. The seam strength of Welt seam was higher to the Plain seam but lower to than the Lapped seam. Also the seams made in warp directions will have the higher seam strength and elongation when compared to the seams made in weft direction. Therefore Lapped seam could be used in applications like joining side seams of jeans, shirts due to its high seam strength. Due to the relative good abrasive resistance and strength Welt seam could be used in seat seams of men's trousers and joining of coats and trousers. By selecting appropriate seam types poor seam performance and failures during usage can be minimized.

Supervisor/s: Dr M. E. R. Perera

Abstract No: TT110

A Study to Investigate the Reasons for Non - Achievement of Target Efficiency during Style Change Over Period

S. T. S. Karunatilake

Department of Textile and Apparel Technology, Faculty of Engineering Technology
The Open University of Sri Lanka.
prasangi.maheshika.perera43@gmail.com
ThilangiK@masholdings.com

Star Garments (Pvt.) Ltd is a leading apparel manufacturing organization in Sri Lanka. It has four branches. There was a major concern in lack of efficiency in sewing production modules of Kaduwela branch. In Kaduwela branch, it was reported that the sewing production efficiency was 5% less than the given norm throughout the year 2012. This was a major concern and had badly affected to the image of the Kaduwela branch when comparing with the other branches of the group.

The main objective of this research was to investigate the reasons for non- achievement of target efficiency during style change over period. At the start of the study several activities were done including brain storming sessions to find out the possible reasons for the problem. In addition to that data was collected to identify the real reasons for lower efficiency. For this purpose 20 styles were selected and studied the efficiency patterns of the total production duration. It was found that one of the major cause was the lower efficiency achieved during the change over period.

Once the problem was identified, further 59 styles were selected for further analysis. These styles were stitched during the months of October, November and December 2012. For this analysis all the production modules were selected. For the analysis purposes, day wise analysis and style wise analysis were performed for the first eight days, that is change over period.

The reasons were analyzed and it was found that the major reasons are feeding delays (36%), poor planning by the production department (16%) and the non-identification of possible problems in advanced by the technical department (12%).

These three reasons were further analyzed. To collect necessary data for each and every cause, brain storming sessions were held with the members of the responsible departments. Suggestions were list for each and every reason and the cost effective suggestions were implemented to overcome issue.

Supervisor/s: Dr M. E. R. Perera

Abstract No: TT111

The Effects of Fabric Weight and Stitch Density on Seam Strength of Selected Single Jersey Fabrics

K. M. U. Anuruddika Karunatilake

Department of Textile and Apparel Technology, Faculty of Engineering Technology
The Open University of Sri Lanka.
Anuruddika.karunathilake@gmail.com

In apparel manufacturing process, the sewing process is one of the most critical processes, which determine the product quality and the productivity. Seam strength refers to a load required to break a seam. When two pieces of fabric are joined by a seam and an increasing force is applied to the assembly at right angles to the seam line failures may occur. The breaking load is same or lesser than the required load to break an un-sewn strip of the same fabric. As every seam has two components that are fabric and sewing thread, seam damage results from the breakage of either fabric or thread or in some cases both simultaneously.

The objective of the research is to study the effect of fabric weight and the stitch density on seam strength of selected single jersey fabrics made of 100% cotton.

For this study three different fabrics with weights of 130 gm^{-2}, 155 gm^{-2} and 200 gm^{-2} were used. Six stitch densities 9, 10, 11, 12, 13 and 14 per inch were selected. Two different sewing machines namely single needle lock stitch and single needle chain stitch were used to make samples. All other required stitching parameters were kept constant.

The samples were prepared according to the strip method described in the standard EN ISO 13935 – 1. Sixty samples were prepared for each and every stitch density selected. Out of the sixty samples, thirty samples each were prepared by using the single needle lock stitch and single needle chain stitch machines. For the each fabric weight ten samples were prepared. Out of these ten samples, five samples were prepared seam parallel to the course direction and the other five samples were prepared seam parallel to wale direction. The used seam is the plain seam.

The prepared samples were tested by using tensile tester CRE type - TINIUS OLSEN H5KS for the comparison purposes. The necessary data was collected for each and every sample made, sorted out and analyzed separately to investigate the effect of fabric weight and stitch density on seam strength of selected single jersey fabrics. The outcome of this research could be used to design seams with better performances in apparel industry.

Supervisor/s: Dr M. E. R. Perera